SOIL SURVEY OF

Harford County Area, Maryland

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Maryland Agricultural Experiment Station

Major fieldwork for this soil survey was done in the period 1940–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service and the Maryland Agricultural Experiment Station. It is part of the technical assistance furnished to the Harford Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of the Harford County Area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the woodland group to which the soil has been assigned.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the descriptions of the capability units and the woodland groups.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and for recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain estimates of soil properties and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation, Morphology, and Classification of the Soils."

Newcomers in the Harford County Area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given at the beginning of the publication in the section "General Nature of the Area."

Cover: Typical scene in northern part of the Harford County Area. Stripcropping on gently sloping Chester soils. Wooded area in background along the Susquehanna River is mostly Neshaminy and Montalto soils.

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Issued August 1975

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SOILS SURVEYED BY PHILLIP J. WALTER, J. S. HARDESTY, JAMES D. SHEETZ, W. H. COATES, J. R. PITSENBERGER, R. S. LONG, W. U. REYBOLD, III, AND R. E. ANDERSEN, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE MARYLAND AGRICULTURAL EXPERIMENT STATION

THE HARFORD COUNTY AREA is in the northeastern part of Maryland (fig. 1). The survey area makes up about 84 percent of Harford County. The total land area is 242,175 acres or about 378 square miles. The county is bounded on the southeast by Chesapeake Bay, on the northeast by the Susquehanna River, and on the north by York County, Pa., along the Mason Dixon Line. Little Gunpowder Falls forms the longest segment of boundary against Baltimore County to the west. Bel Air, in the south-central part of the county, is the county seat. Other important towns are Aberdeen, Havre de Grace, Joppatowne, and Edgewood. The Edgewood Arsenal and the Aberdeen Proving Ground military reservations were not surveyed.

Most of the soils in the county are well suited to a wide variety of farm and nonfarm uses. The main exceptions are the steep and stony areas, mostly in the northern part of the county, the swampy areas, and the marshy tidal areas that border parts of Chesapeake Bay and parts of tidal streams and estuaries. The main overall concern in soil management is erosion control. Of the soils in the survey area, about 86 percent are moderately or severely eroded.

General Nature of the Area

Harford County was part of Baltimore County from 1659 until 1773. It was separated from Baltimore County in 1773 by Act of Assembly, and its boundaries have not been changed significantly since then. Bel Air was selected as the county seat in 1782.

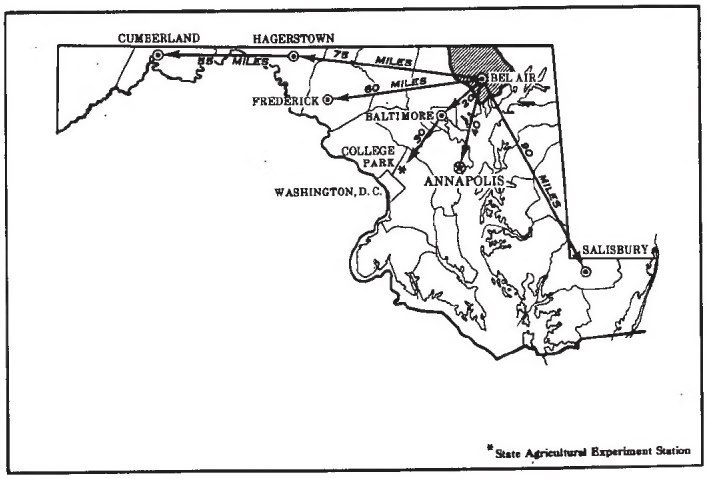

Figure 1.—**Location of the Harford County Area in Maryland.**

In 1970, according to the U.S. Bureau of the Census, the population of the county was 115,378 and it was 52 percent urban. Between 1960 and 1970, the total county population increased 50 percent, urban population increased 165 percent, and rural population increased 3 percent. Other populations in 1970 were: Aberdeen, 12,375, Havre de Grace, 9,791; Joppatowne, 9,092; Edgewood, 8,551; Aberdeen Proving Ground, 7,403; and Bel Air, 6,307.

On the following pages is general information about physiography, relief, drainage, geology, climate, farming, transportation, industry, mineral resources, and water resources in the Harford County Area. This information will be most useful to persons not familiar with the county. More detailed information can be obtained from the Harford County Office of Planning and Zoning, County Office Building, Bel Air, Md. 21014.

Physiography, Relief, Drainage, and Geology

The Harford County Area straddles the boundary between Cretaceous and younger, unconsolidated sediment of the Atlantic Coastal Plain of the southeast and the highly complex Precambrian to lower Paleozoic metamorphic and igneous rocks of the Appalachian Piedmont on the northwest (*5*).[1] Along the Fall Line, the Coastal Plain formations unconformably overlap the crystalline rocks of the Piedmont and generally dip very gently seaward and also thicken in that direction.

The Piedmont Plateau, which makes up the northern three-fourths of the county, is a very old upland dissected by many small streams and drainageways. The crystalline rocks of the Piedmont for the most part are intensely deformed schist and gneiss in which primary features are seldom well preserved. The oldest rock formation in the Harford County Area is the Baltimore Gneiss of Precambrian age. Overlying the Baltimore Gneiss is the Glenarm Series of metamorphic rocks, consisting of the Setters Formation at the base, the Cockeysville Marble, and the Wissahickon Formation at the top (*5*). The age of these rocks has been debated for years, but generally they are believed to be either late Precambrian or Cambrian. In the northern part of the Piedmont, the Wissahickon Formation under-

[1] Italic numbers in parentheses refer to Literature Cited, p. 116.

TABLE 1.—*Temperature and precipitation*

[Data from Bel Air, Harford County, Md., August 1948–December 1971. Elev. 365 feet]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—[1]		Average total	One year in 10 will have—		Days with snow cover 1 inch or more	Average depth of snow on days with snow cover of 1 inch or more
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		More than—	Less than—		
	°F	°F	°F	°F	*Inches*	*Inches*	*Inches*	*Number*	*Inches*
January	41.4	22.2	56	7	3.10	5.4	1.5	8	3
February	44.4	23.9	58	10	3.21	4.6	1.6	6	4
March	52.4	29.8	70	18	3.98	5.5	1.4	3	3
April	64.9	39.9	82	29	3.87	7.0	1.5	0	0
May	74.5	49.7	87	38	3.86	7.8	1.5	0	0
June	82.5	58.9	92	47	3.70	5.8	1.5	0	0
July	86.1	63.5	93	55	4.33	6.7	1.4	0	0
August	84.3	62.0	92	52	5.11	8.7	1.1	0	0
September	78.2	55.2	89	42	3.96	7.0	.6	0	0
October	68.3	44.4	81	30	2.81	6.7	1.2	0	0
November	55.6	34.3	68	22	3.89	7.0	1.2	(2)	(3)
December	43.9	25.1	60	11	4.01	7.0	.9	5	3
Year	64.7	42.4	[4] 96	[5] 1	45.83	54.6	36.6	22	3

[1] Recorded in 1951–53 and 1956–70.
[2] Less than 0.5 day.
[3] Average depth of 5 inches during the three significant November snowstorms in period of record.
[4] Average annual highest temperature.
[5] Average annual lowest temperature.

lies the Cardiff Metaconglomerate, which in turn is overlain by the Peach Bottom Slate. The elevation of the Piedmont ranges from about 400 feet in the southern part to more than 800 feet near Whiteford in the northern part.

Coastal Plain sediment occupies the southern one-fourth of the Harford County Area. The Potomac Group of Early Cretaceous age and the Talbot Formation of Pleistocene age are the main Coastal Plain sediment. This sediment tends to thicken to the south. It is extensively dissected, particularly at the higher elevations in the northern part of the Coastal Plain where many streams have downcut deeply and have produced very hilly topography. The southern part of the Coastal Plain is a broad lowland which rises gradually from sea level along the Chesapeake Bay to an elevation of about 90 feet near Aberdeen. Although this part of the Coastal Plain is less dissected than in the northern part, such large estuaries as the Bush and Bird Rivers form broad reentrants into this lowland. In general, the elevation of the Coastal Plain ranges from sea level along Chesapeake Bay to about 400 feet in the extreme northern part.

Drainage for the survey area is provided by several streams. The northern part of the county is drained by the Susquehanna River and its tributaries. Broad Creek and Deer Creek are major streams that flow directly into the Susquehanna River. In the southern part of the county, a number of streams flow generally southward toward the bay estuaries. Principal among these are Little Gunpowder Falls, which flows into the Gunpowder River and forms most of the western county boundary, and Winters Run, Bynum Run, and Grays Run, which flow into the Bush River. Swan Creek flows into the bay area near Havre de Grace. All of the streams have relatively narrow valleys and steep banks.

Climate[2]

The Harford County Area is in the middle latitudes where the general atmospheric flow is from west to east. It has a continental type climate marked by temperature contrasts between summer and winter. The Chesapeake Bay and its tributaries, and the Atlantic Ocean to a lesser degree, have a modifying control on the climate, especially in moderating extreme temperatures.

Data in table 1 are based on the climatic record at Bel Air, which is in the south-central part of the survey area. These data are fairly representative of most of the survey area, except for those areas bordering Chesapeake Bay.

The warmest period of the year is during the last half of July when the maximum afternoon temperature averages about 88°F. A temperature of 90°, or higher, occurs on an average of 20 days a year. The coldest period of the year is during the last of January and the first of February when the early morning minimum temperature averages about 18°. The average number of days when the daily minimum temperature is 32°, or lower, is 119 days. The highest recorded temperature in the county was 105° at Aberdeen on July 10, 1936. The lowest recorded temperature was −18° at Van Bibber on February 9, 1934.

The average dates of the last spring and first fall occurrences of minimum temperatures equal to or below specified threshold values are shown in table 2. The period between the last 32° temperature in spring and the first 32° tempera-

[2] By W. J. MOYER, State climatologist, National Oceanic and Atmospheric Administration, National Weather Service, U.S. Department of Commerce.

TABLE 2.—*Probability of last freezing temperature in spring and first in fall*

[Data based on observations at Bel Air, Harford County, Md., August 1948–December 1971]

Probability	Dates for given probability and temperature		
	32°F or lower	24°F or lower	16°F or lower
Spring:			
9 years in 10 later than	Apr. 10	Mar. 14	Feb. 22
3 years in 4 later than	Apr. 15	Mar. 20	Feb. 26
2 years in 3 later than	Apr. 16	Mar. 22	Feb. 28
1 year in 2 later than	Apr. 20	Mar. 26	Mar. 3
1 year in 3 later than	Apr. 24	Mar. 30	Mar. 6
1 year in 4 later than	Apr. 25	Apr. 1	Mar. 8
1 year in 10 later than	Apr. 30	Apr. 7	Mar. 12
Fall:			
1 year in 10 earlier than	Sept. 29	Nov. 1	Nov. 26
1 year in 4 earlier than	Oct. 8	Nov. 6	Dec. 2
1 year in 3 earlier than	Oct. 11	Nov. 8	Dec. 5
1 year in 2 earlier than	Oct. 17	Nov. 12	Dec. 9
2 years in 3 earlier than	Oct. 23	Nov. 16	Dec. 13
3 years in 4 earlier than	Oct. 26	Nov. 18	Dec. 16
9 years in 10 earlier than	Nov. 4	Nov. 23	Dec. 22

ture in the fall, often defined as the growing season, averages 180 days at Bel Air.

During the period 1948-1971, the annual precipitation at Bel Air ranged from a low of 32.20 inches in 1954 to a high of 66.42 inches in 1971. The distribution of monthly precipitation is fairly uniform throughout the year; the maximum is in August. The maximum for any 1 month is 17.80 inches at Bel Air during August 1967. The annual snowfall averages 22 inches, but varies considerably from year to year. It has ranged from as little as a trace in the 1949-50 season to 64 inches in the 1957-58 season.

Drought can occur in any month or season, but serious drought is more likely to occur in summer. Generally, the rainfall and the soil moisture are adequate for good crop yields. In some years, unequal distribution of summer showers and occasional dry periods at critical stages in crop development make irrigation necessary in order to achieve maximum crop yields.

Thunderstorms occur on an average of about 34 days per year and hail occurs on an average of about 1 or 2 days a year. Tornados are rare and have, in the past, caused little damage. Tornados occur on an average of one or two a year in the entire state. Tropical storms or hurricanes affect the survey area about once a year, usually in the period August through October. Most of these have caused only minor damage.

Prevailing winds are from the west to northwest except during the summer when they become more southerly. The average annual wind velocity is about 10 miles per hour but winds can reach 50 to 60 miles per hour and higher during severe thunderstorms, hurricanes, or intense winter storms.

Farming

Despite the rapid urbanization of the Harford County Area, farming is still an important enterprise. According to the 1969 census (*4*), 133,452 acres of land in Harford County was farms. The number and size of farms in 1964 and in 1969 were as follows:

	1964	*1969*
Farms—number	1,060	839
Land in farms—acres	151,765	133,452
Average size of farm—acres	143	159

In 1964, income from crops accounted for less than 17 percent of the total income from farm products sold in the county. In 1969, about 19 percent of the total income from farm products came from the sale of crops. Acreages of the main field crops in 1964 and in 1969 were as follows:

	1964	*1969*
Corn	20,239	19,359
Wheat	4,644	2,795
Soybeans	149	963
Hay	26,792	17,795
Irish and sweetpotatoes	51	22
Vegetables, including sweet corn, and melons	3,746	4,246
Orchard crops	425	623

As a percentage of the total income from farm products, the sale of livestock and poultry accounted for about 82 percent in 1964 and about 80 percent in 1969. The number of livestock and poultry raised in 1964 and in 1969 was as follows:

	1964	*1969*
Cattle and calves	35,601	28,724
Milk cows	17,351	11,287
Horses and ponies	-------	1,491
Hogs and pigs	4,271	3,371
Sheep and lambs	1,048	1,468
Chickens	76,996	42,805

Transportation and Industry

The Harford County Area has excellent transportation facilities, including several major State and Federal highways and branches of railroads. The major highways in the survey area are Interstate 95, U.S. 40, and U.S. 1. Many motor freight lines regularly serve the survey area. Three airfields in Harford County are equipped for landing and storage of light aircraft. Several bus lines provide interstate bus service.

The Harford County Area is rapidly becoming industrialized, particularly in the southeastern part. In 1971, Harford County had approximately 5,000 acres of land that was zoned industrial. There are 12 industrial parks in the county. All areas along the industrial corridor have easy accessibility to Interstate 95.

Recreation

The county has excellent recreation facilities. Easy accessibility to the Chesapeake Bay, as well as to the Susquehanna and Gunpowder Rivers, make swimming, fishing, ice skating, and boating valuable recreational assets in the Harford County Area. Rocks, Gunpowder, Susquehanna, and Palmer State Parks have facilities for picnicking, camping, hiking, and fishing. Similiar facilities are available at the county-operated Flying Point Park. Skiing is available at the county-owned park at Eden Mill.

The survey area has excellent open water areas for shooting ducks and geese, as well as areas for inland hunting of deer and small game. More than 1,600 boats were registered in Harford County in 1971, and launching and docking facilities

are available at marinas along the waterways in the survey area. There were no public golf courses in the survey area in 1971, but several private clubs had open membership.

Mineral Resources

Mineral resources in the Harford County Area include metallic and nonmetallic minerals, building and decorative stone, crushed stone, sand and gravel, and clay. Such commodities as iron, chromite, feldspar, quartz, and asbestos are no longer produced, but are of historical interest. Crushed stone and sand and gravel are the major minerals presently produced in the county. These materials are used in the construction and building industries and reflect the increasing degree of urban development in the county. Most of the natural gravel deposits are located along the Fall Line. Talc, serpentinite, basalt, and marble are also produced.

Water Resources

The Harford County Area has both ground water and surface water supplies. In the northern Piedmont areas, ground water supplies depend on the character, extent, and structure of the hard crystalline rocks. Well yields in this area are low, averaging about 5 to 10 gallons per minute (*14*)[3], and are adequate only for individual homes. In the Coastal Plain areas of the county, properly developed wells yield 150 to 300 gallons per minute and are sufficient for municipal supplies. The Coastal Plain overlies porous and permeable unconsolidated stratified sediment. These aquifers conduct and store large quantities of ground water as it flows from the Piedmont to the coastal areas.

The town of Aberdeen, several industries, a number of subdivisions, and several such outlying communities as Darlington and Cardiff-Whiteford use ground water sources. Aberdeen Proving Ground, Bel Air, Edgewood, and Havre de Grace use water from Deer Creek, Winter Run, or the Susquehanna River. Recently, the city of Baltimore constructed a 9-foot diameter water conduit across the survey area. This conduit is capable of supplying Baltimore City with 300 million gallons daily from the Susquehanna River at Conowingo Dam. The conduit is provided with taps for local requisition.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in the Harford County Area, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Chester and Glenelg, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Chester silt loam, 0 to 3 percent slopes, is one of several phases within the Chester series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of the Harford County Area: soil complexes and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Manor and Glenelg very stony loams, 3 to 15 percent slopes, is an example.

In most areas surveyed, there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These

[3] Information in the *Harford County Water and Sewerage Report* was compiled by WHITMAN, REQUARDT, and ASSOCIATES.

places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Stony land, steep, is an example of a land type in the Harford County Area.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing medium for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to slow permeability or a high water table. They see that streets, road pavements, and foundations for houses crack on a given kind of soil and they relate this failure to a high shrink-swell potential. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of a soil for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the Harford County Area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The general soil map at the back of this survey does not join in all instances with the general soil maps of adjacent counties. Differences in the maps have resulted from the differences in the occurrence of soil patterns, the demand for more detail on this map, and the recent advances in soil classification.

The 13 soil associations in this survey have been grouped into three general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in each group are described on the following pages.

Soils of the Piedmont Plateau

The soils in the eight associations in this group formed mainly in residuum that weathered in place from acid or basic rocks. They are nearly level to steep. Some of the steep soils are very stony.

1. Manor-Glenelg association

Deep, steep to gently sloping, somewhat excessively drained and well drained soils that are underlain by acid crystalline rocks; on uplands

This association is mainly a hilly upland that is thoroughly dissected by streams. Most of the steeper areas, particularly the bluffs along streams, are stony. This association, the largest in the survey area, makes up about 23 percent of the total acreage. It is 50 percent Manor soils, 30 percent Glenelg soils, and 20 percent less extensive soils.

Manor soils are well drained to somewhat excessively drained and are loamy throughout. They overlie acid crystalline rock at a depth of about 6 to 10 feet. They are gently sloping to steep and generally are on the higher parts of the landscape.

Glenelg soils are well drained and loamy throughout. They overlie acid crystalline rock at a depth of 4 to 10 feet. They are gently sloping to strongly sloping and generally are on the lower, less sloping parts of the landscape.

Less extensive in this association are Chester, Brandywine, Glenville, Codorus, Baile, and Hatboro soils and Stony land, steep. Chester and Brandywine soils are mainly on ridgetops and upper slopes. Glenville and Baile soils generally are in draws and around the heads of drainageways. Codorus and Hatboro soils are on flood plains. Stony land, steep, is generally on bluffs above streams.

The present uses are mainly farming and woodland. Breeding and raising horses are major farm enterprises. The most important crops are corn, soybeans, hay, and pasture plants. Erosion and stoniness are the major limitations. About 90 percent of the association is moderately to severely eroded.

2. Chester-Glenelg-Manor association

Deep, nearly level to steep, well drained and somewhat excessively drained soils that are underlain by acid crystalline rock; on uplands having broad ridgetops

This association (fig. 2) is a rolling, strongly dissected upland that has broad ridgetops. It makes up about 15 percent of the survey area. It is about 55 percent Chester soils, about 20 percent Glenelg soils, about 10 percent Manor soils, and about 15 percent less extensive soils.

Chester soils are well drained and are loamy throughout. They overlie acid crystalline rock at a depth of about 5 to 10 feet. They are nearly level to strongly sloping and are on broad ridgetops and adjacent upper parts of slopes.

Glenelg soils are well drained and loamy throughout. They overlie acid crystalline rock at a depth of about 4 to 10 feet. They generally are gently sloping to moderately sloping and are on the lower parts of the landscape.

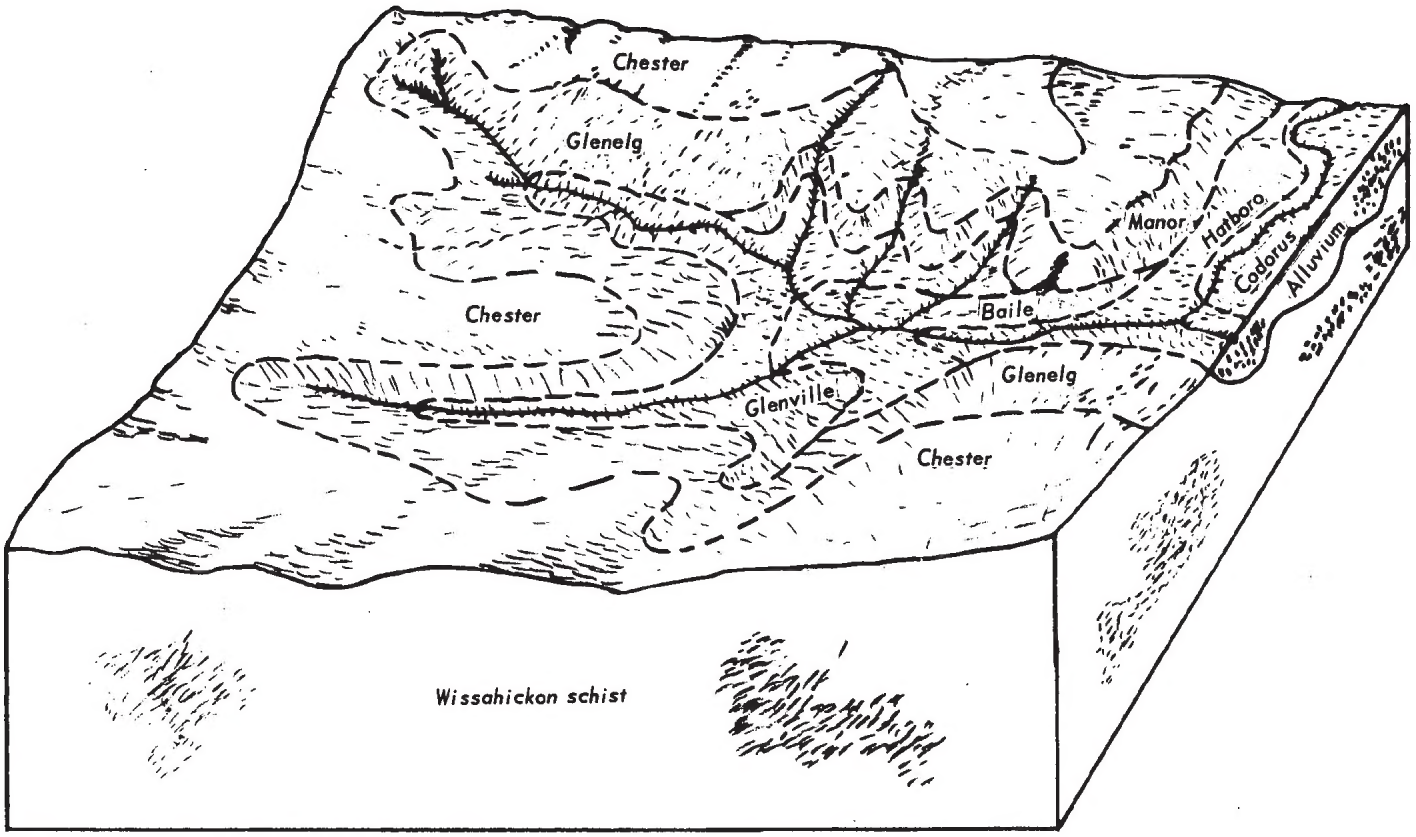

Figure 2.—**Pattern of soils and parent material in Chester-Glenelg-Manor association.**

Manor soils are well drained to somewhat excessively drained. They are loamy material that overlies acid crystalline rock at a depth of about 6 to 10 feet. They are gently sloping to steep and generally are on the higher parts of the landscape.

Less extensive in the association are Glenville, Baile, Codorus, and Hatboro soils. Glenville and Baile soils generally are in draws and around heads of drainageways. Codorus and Hatboro soils are on flood plains.

This association is better suited to farming than any association in the Harford County Area. Dairying and breeding and raising of horses and beef cattle are major farm enterprises. Production of green peas for canning is common throughout most of this association. The main crops are corn, soybeans, hay, and pasture. The major soils of this association have few limitations except those imposed by slope and the hazard of erosion.

3. *Elioak-Glenelg association*

Deep, gently sloping to strongly sloping, well-drained soils that are underlain by acid crystalline rock; on uplands having broad ridgetops

This association is mostly a rolling, strongly dissected upland that has broad ridgetops. It makes up about 2 percent of the total acreage. It is 70 percent Elioak soils, 25 percent Glenelg soils, and 5 percent less extensive soils.

Elioak soils are well drained. They have a loamy surface layer and a loamy to clayey subsoil. They are underlain by acid crystalline rock at a depth of about 5 to 10 feet. These soils are gently sloping and moderately sloping and are on broad ridgetops and adjacent upper parts of slopes.

Glenelg soils are well drained and are loamy throughout. They overlie acid crystalline rock at a depth of about 4 to 10 feet. They are gently sloping to strongly sloping and generally are on the lower parts of the landscape.

Less extensive in this association are Chester and Manor soils. Chester soils are mainly on broad ridgetops. Manor soils generally are on the higher, steeper parts of the landscape.

The present use is mainly farming. Dairying and breeding and raising beef cattle are minor farm enterprises. The most important crops are corn, soybeans, hay, and pasture. Erosion is the major limitation. Most of the association is moderately to severely eroded.

4. *Glenelg-Manor association*

Deep, gently sloping to steep, well drained and somewhat excessively drained soils that are underlain by acid crystalline rock; on uplands

This association is mostly a rolling to hilly upland that is thoroughly dissected by streams. Most of the steeper areas, particularly the high cliffs and bluffs along streams, are stony. This association makes up about 9 percent of the total acreage of the survey area. It is 55 percent Glenelg soils, 30 percent Manor soils, and 15 percent less extensive soils.

Glenelg soils are well drained and are loamy throughout. They overlie acid crystalline rock at a depth of about 4 to

10 feet. They are gently sloping to strongly sloping and are on the lower parts of the landscape.

Manor soils are well drained to somewhat excessively drained and are loamy throughout. They overlie acid crystalline rock at a depth of about 6 to 10 feet. They are gently sloping to steep and generally are on the higher parts of the landscape.

Less extensive in this association are Chester, Elioak, Brandywine, Codorus, Hatboro, and Comus soils and Stony land, steep. Chester and Elioak soils generally are on the crests of broad ridgetops. Brandywine soils generally are on sides and crests of some of the steeper hills of the association. Codorus, Hatboro, and Comus soils are on flood plains. Stony land, steep, generally is on high bluffs and cliffs along major streams.

The present uses are mainly farming and woodland. Many of the steeper and stony areas are wooded. The most important crops are corn, soybeans, hay and pasture. A few horse breeding, dairy, and beef enterprises are scattered throughout this association. Erosion is the major limitation. In some areas stoniness is a limitation. About 85 percent of this association is either moderately or severely eroded.

5. *Whiteford association*

Moderately deep to deep, gently sloping and moderately sloping, well-drained soils that are underlain by acid slate bedrock; on uplands having broad ridgetops

This association is a gently rolling upland that has extensive broad ridgetops. It is unique in that it is the only association in the survey area that is underlain by slate bedrock. This association, the smallest in the survey area, makes up less than 1 percent of the total acreage. It is about 95 percent Whiteford soils and about 5 percent Chester and Glenelg soils.

Whiteford soils are well drained and are loamy throughout. They overlie acid slate bedrock at a depth of about 3 to 5 feet. They are gently sloping and moderately sloping and are on broad ridgetops.

Chester soils generally are on broad ridgetops. Glenelg soils generally are on the steeper or more rolling parts of the landscape.

Growing and canning green peas and beans are important farming enterprises. Other important crops are corn, soybeans, hay, and pasture. Slope and the hazard of erosion are the major limitations. Flat slate fragments on the surface interfere with tillage in places. Some land, mostly around slate quarries, is idle. All of the quarries have been abandoned and are reforesting. High piles of slate (fig. 3) near the quarries are features characteristic of the landscape.

6. *Neshaminy-Aldino-Watchung association*

Deep, steep to nearly level, well drained to poorly drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands having many broad flats

This association is a rolling to hilly upland that has many broad flats and depressions. The association makes up about 20 percent of the total acreage of the survey area. It is 25 percent Neshaminy soils, 20 percent Aldino soils, 15 percent Watchung soils, and 40 percent less extensive soils.

Neshaminy soils are deep and well drained and are loamy throughout. They overlie semibasic or mixed basic and acidic rock at a depth of about 4 to 10 feet. They are nearly level to steep and generally are on the higher parts of the landscape.

Aldino soils are moderately well drained soils that are loamy throughout. They are moderately deep over a fragipan and are underlain by basic rock at a depth of about 3½ to 6 feet. They generally are nearly level to moderately sloping and generally are on the lower parts of the landscape.

Watchung soils are deep and poorly drained. They have a loamy surface layer and a dominantly clayey subsoil. They overlie basic rock at a depth of about 5 to 10 feet. They are nearly level to gently sloping and generally are on flats or in depressions.

Less extensive in this association are Montalto, Kelly, Chrome, Legore, Chillum, Hatboro, Codorus, and Comus series and Stony land, steep. Montalto, Kelly, and Chillum soils generally are nearly level to moderately sloping. Legore soils generally are moderately sloping to strongly sloping. Chrome soils are on sides of high ridges. They have a sparse stunted plant cover because they are only moderately deep over serpentine bedrock. Stony land generally is on high bluffs or cliffs above streams. Hatboro, Codorus, and Comus soils are on flood plains.

The trend in land use is toward nonfarm enterprises. Much of this association has undergone urban and industrial development. Parts of it extend into the Industrial Corridor, and industrial parks are common. There are only a few general farms and horse breeding and livestock enterprises. Erosion and stoniness in the higher, steeper areas are major limitations. Drainage is a major limitation on the flats and in depressions.

7. *Montalto-Neshaminy-Aldino association*

Deep, steep to nearly level, well drained and moderately well drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands

This association is mainly a rolling, dissected upland that is hilly in places. It makes up about 5 percent of the survey area. It is about 45 percent Montalto soils, 15 percent Neshaminy soils, 15 percent Aldino soils, and 25 percent less extensive soils.

The deep, well-drained Montalto soils have a loamy surface layer and a dominantly clayey subsoil. They overlie basic rock at a depth of about 5 to 12 feet. They are mostly nearly level to moderately sloping and generally are on the lower parts of the landscape.

The well-drained Neshaminy soils are deep and are loamy throughout. They overlie semibasic or mixed basic and acidic rock at a depth of about 4 to 10 feet. They are nearly level to steep and generally are on the higher parts of the landscape.

Aldino soils are moderately well drained and are moderately deep over a fragipan. They are loamy throughout and overlie basic rock at a depth of about 3½ to 6 feet. They are nearly level to moderately sloping and generally are on the lower parts of the landscape.

Less extensive in this association are Watchung, Chrome, Kelly, Legore, Delanco, Elsinboro, Hatboro, Codorus, and Comus soils. Watchung soils generally are on flats or in depressions. Chrome soils are on sides of highly dissected ridges. Kelly soils are gently sloping to moderately sloping. Legore soils are nearly level to steep. Delanco and Elsinboro soils are on low terraces along streams. Hatboro, Codorus, and Comus soils are on flood plains.

General farming and livestock enterprises are present uses, but except for horse breeding the trend is toward nonfarm uses. Many areas in this association are undergoing rapid urban and commercial development. Erosion and stoniness

Figure 3.—**High piles of slate are characteristic features throughout much of the Whiteford association.**

are major limitations. Drainage is a limitation in some of the nearly level areas and in depressions.

8. Legore-Neshaminy-Aldino association

Deep, nearly level to steep, well drained and moderately well drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands

This association is a rolling to hilly dissected upland. It makes up about 2 percent of the survey area. It is about 40 percent Legore soils, 25 percent Neshaminy soils, 20 percent Aldino soils, and 15 percent less extensive soils.

Legore soils are deep and well drained and are loamy throughout. They overlie basic rock at a depth of about 5 to 10 feet. They generally are gently sloping to steep.

Neshaminy soils also are deep and well drained and are loamy throughout. They are nearly level to steep and overlie semibasic or mixed basic and acidic rock at a depth of about 4 to 10 feet.

Aldino soils are moderately well drained and are loamy throughout. They are moderately deep over a fragipan and are underlain by basic rock at a depth of about 3½ to 6 feet. They generally are nearly level to moderately sloping.

Less extensive in this association are Watchung, Montalto, Hatboro, Codorus, and Comus soils and Stony land, steep. Watchung soils generally are on upland flats and in depressions. Montalto soils are nearly level to gently sloping and are on uplands. Hatboro, Codorus, and Comus soils are on flood plains. Stony land, steep, generally is on high cliffs or bluffs above the major rivers.

The present trend in land use is toward nonfarming. Much of the association is woodland, and part is permanent pasture (fig. 4). A few small areas are residential developments. Stoniness and steepness are major limitations. Erosion is also a limitation in places.

Soils of the Atlantic Coastal Plain

The soils in the three associations in this group formed mainly in thick deposits of Coastal Plain sediments. They are nearly level to steep, and some are sandy and gravelly. Association 9 is made up of both Coastal Plain and Piedmont soils, but is dominantly Coastal Plain soils and, thus, is grouped with those soils.

9. Neshaminy-Chillum-Sassafras association

Deep, nearly level to steep, well-drained soils that are underlain by semibasic or mixed basic and acidic rocks or sandy and gravelly Coastal Plain sediment; on uplands

This association is undulating to hilly on the Piedmont uplands and undulating to rolling on uplands of the Coastal

Figure 4.—**Permanent pasture on Legore-Neshaminy-Aldino association.**

Plain. Some areas on the Coastal Plain are broad and smooth. In many areas this association straddles the Fall Line between the Piedmont Plateau and the Coastal Plain. It makes up about 2 percent of the survey area. It is 30 percent Neshaminy soils, 20 percent Chillum soils, 20 percent Sassafras soils, and 30 percent less extensive soils.

Neshaminy soils are deep, well-drained loamy soils that overlie semibasic or mixed basic and acidic rock at a depth of about 4 to 10 feet. They are nearly level to steep and generally are on the highest parts of the landscape.

Chillum soils are well-drained loamy soils that are moderately deep over a hard gravelly layer and are underlain by gravelly material at a depth of about 20 to 30 inches. They are gently sloping to moderately sloping and are on broad, smooth uplands or on somewhat hummocky uplands where slopes are short.

Sassafras soils are deep, well-drained loamy soils that are chiefly underlain by sandy material at a depth of about 30 to 40 inches. They are gently sloping to steep. The landscape is dominantly undulating, but has some short, steeper slopes.

Less extensive in this association are Watchung, Legore, Montalto, Matapeake, Beltsville, and Elsinboro soils and Alluvial land. Watchung soils are on flats and in depressions. Legore and Montalto soils generally are on rolling to hilly parts of the uplands. Matapeake and Beltsville soils are on broad, smooth uplands. Elsinboro soils are on low terraces along streams. Alluvial land is on flood plains.

For the most part, the trend in this association is toward nonfarming uses. There are a few general farms. Erosion is a hazard in some parts.

10. Beltsville-Loamy and Clayey land-Sassafras association

Deep, nearly level to steep, well drained and moderately well drained soils that are underlain by sandy, loamy, gravelly, or clayey sediment; on uplands

This association is a gently undulating to hilly upland. It makes up about 8 percent of the survey area. It is about 30 percent Beltsville soils, 30 percent Loamy and clayey land, 20 percent Sassafras soils, and 20 percent less extensive soils.

Beltsville soils are moderately well drained and moderately deep over a fragipan. They are loamy and overlie, at a depth of about 40 to 64 inches, older loamy sediment that is commonly gravelly. They are nearly level to moderately sloping and are mainly on smooth to undulating landscape.

Loamy and clayey land is deep and generally well drained. It is loamy and overlies older clayey deposits at variable depths. It is nearly level to steep and is mainly on hilly parts of the landscape.

Sassafras soils are deep and well drained. They are loamy and overlie dominantly sandy material at a depth of about 30 to 40 inches. They are gently sloping to steep and are on a landscape that is dominantly undulating, but has some short steeper slopes.

Less extensive in this association are the Evesboro, Joppa, Keyport, Elkton, Fallsington, Chillum, Matapeake, Mattapex, Woodstown, Othello, and Leonardtown soils and Alluvial land. Evesboro and Joppa soils generally are in hilly areas in higher parts of the Coastal Plain. Elkton, Fallsington, Leonardtown, and Othello soils are on upland interfluvial flats. Keyport, Chillum, Matapeake, Mattapex, and Woodstown soils are nearly level to gently sloping and occupy undulating to broad, smooth parts of uplands. Alluvial land is on flood plains.

The present use is almost totally nonfarming. Some areas are wooded. Most of the association has been developed for residential, commercial, and industrial purposes. Poor stability of the soils in most areas is a major limitation. Steep cuts are extremely difficult to stabilize. Some areas are good sources of sand and gravel.

11. Matapeake-Mattapex association

Deep, nearly level and gently sloping, well drained and moderately well drained soils that are underlain by sandy and loamy sediment; on broad, smooth uplands

This association is a broad, smooth upland. It makes up about 4 percent of the survey area. It is about 40 percent Matapeake soils, 40 percent Mattapex soils, and 20 percent less extensive soils.

Matapeake soils are deep, well-drained loamy soils that overlie dominantly sandy sediment at a depth of about 26 to 40 inches.

Mattapex soils are deep and moderately well drained. They are loamy and overlie older, coarser textured loamy sediment or sandy sediment at a depth of about 30 to 40 inches.

Both the Matapeake and Mattapex soils are nearly level to gently sloping.

Less extensive in this association are Othello, Keyport, Beltsville, Chillum, Sassafras, Elsinboro, and Delanco soils. Othello soils are on upland interfluvial flats. Keyport, Beltsville, and Chillum soils are nearly level to gently sloping and are on undulating to broad, smooth parts of the uplands. Sassafras soils are on a dominantly undulating landscape that has some short steeper slopes. Elsinboro and Delanco soils are on low terraces along streams.

The present use is mainly farming. Growing and canning of truck crops are important farming enterprises. The main crops for canning are green beans, peas, and sweet corn. General farm crops are corn, soybeans, hay, and pasture plants. The major soils of this association have few limitations except those caused by slope and the hazard of erosion.

Soils of the Flood Plains and Low Terraces

The soils in these associations formed mainly in alluvium that was washed down from upland areas of the Piedmont or Coastal Plain. These soils are nearly level to gently sloping.

12. Elsinboro-Delanco association

Deep, nearly level and gently sloping, well drained and moderately well drained soils that are underlain by stratified alluvial sediment; on low terraces

This association consists mainly of low terraces along major streams on the Coastal Plain. It makes up about 4 percent of the survey area. It is about 30 percent Elsinboro soils, 30 percent Delanco soils, and 40 percent less extensive soils.

Elsinboro soils are deep and well drained. They are loamy and overlie old stratified loamy alluvial sediments at a depth of about 28 to 40 inches. They are 6 to more than 20 feet deep over bedrock. They are mainly nearly level to gently sloping.

Delanco soils are deep and moderately well drained. They are loamy and overlie old stratified loamy alluvial sediments at a depth of about 26 to 46 inches. They are 5 to more than 20 feet deep over bedrock. They are nearly level to gently sloping.

Less extensive in this association are Kinkora, Evesboro, Beltsville, Sassafras, Fallsington, Chillum, Keyport, Othello, Matapeake, and Mattapex soils. Kinkora soils are on terraces along streams. Evesboro soils are moderately sloping and are on ridges in the uplands. Beltsville, Chillum, Keyport, Matapeake, and Mattapex soils are nearly level to gently sloping and are on undulating to broad smooth uplands. Sassafras soils are on mostly undulating to hilly uplands. Fallsington and Othello soils are on upland interfluvial flats.

Much of this association is idle. A few golf courses, other recreational facilities, and general farms are scattered throughout this association. Major crops are corn and soybeans. Limitations on the major soils are mostly those caused by slope and the hazard of erosion. Some lower areas are flooded during extremely wet periods.

13. Codorus-Hatboro-Alluvial land association

Deep, nearly level, moderately well drained to very poorly drained soils that are underlain by stratified alluvial sediment; on flood plains

This association consists of nearly level flood plains along the larger streams that drain the uplands of both the Piedmont Plateau and the Coastal Plain. It makes up about 5 percent of the survey area. It is about 35 percent Codorus soils, 30 percent Hatboro soils, 20 percent Alluvial land, and 15 percent less extensive soils.

Codorus soils are deep, loamy, moderately well drained to somewhat poorly drained soils that overlie stratified loamy alluvial sediments at a depth of about 3½ to 5 feet. They are 6 to 10 feet deep over bedrock. They generally are on the flood plains that are closest to the streams.

Hatboro soils are deep and poorly drained. These loamy soils generally overlie stratified loamy alluvial sediments at a depth of about 40 to 60 inches. They are 4 to 10 feet deep over bedrock. They generally are on the flood plains farthest from the streams.

Alluvial land is somewhat poorly drained to very poorly drained. It generally is sandy and overlies stratified sediments at variable depths. It is most extensive on flood plains along streams that drain urban and suburban areas.

Less extensive in this association are Comus soils and Tidal marsh and Swamp. Comus soils generally are on the flood plain close to the streams. Tidal marsh borders Chesapeake Bay and parts of tidal streams and estuaries. Swamp is very wet land that remains under fresh water all, or nearly all, of the time.

A large part of this association is woodland. Except for a few seasonal pastures (fig. 5), the open areas generally are idle. Flooding is a major limitation.

Descriptions of the Soils

In this section the soils of the Harford County Area are described in detail. Each soil series is described in detail,

Figure 5.—**Permanent pasture on flood plain in Codorus-Hatboro-Alluvial land association.**

and then, briefly, the mapping units in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. Color and consistence terms are for moist soil unless otherwise stated. The profile described in the soil series is representative of mapping units in that series.

If a given mapping unit has a profile that in some ways differs from the one described for the series, the differences are stated in the description of the mapping unit, or they are apparent in the name of the mapping unit. The use and management of the soil are suggested in each mapping unit description.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Alluvial land and Swamp, for example, do not belong to a soil series, but nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each capability unit or other interpretative group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 3. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*12*).

Aldino Series

The Aldino series consists of moderately well drained, nearly level to moderately sloping soils on uplands of the Piedmont. These soils are only moderately deep over a fragipan. They formed in material weathered from serpentine bedrock that is overlain by a layer of loamy material, possibly loess. The native vegetation is mixed upland hardwoods, mainly oaks, and some Virginia pine.

In a representative profile the surface layer is brown

TABLE 3.—*Approximate acreage and proportionate extent of soils*

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Aldino silt loam, 0 to 3 percent slopes	440	0.2	Glenville silt loam, 3 to 8 percent slopes	8,170	3.4
Aldino silt loam, 3 to 8 percent slopes	5,260	2.2	Hatboro silt loam	4,000	1.6
Aldino silt loam, 8 to 15 percent slopes	360	.1	Joppa gravelly sandy loam, 2 to 5 percent slopes	450	.2
Aldino very stony silt loam, 0 to 8 percent slopes	1,170	.5	Joppa gravelly sandy loam, 5 to 10 percent slopes	630	.3
Alluvial land	2,520	1.0	Kelly silt loam, 3 to 8 percent slopes	1,110	.5
Baile silt loam, 0 to 3 percent slopes	1,110	.5	Kelly silt loam, 8 to 15 percent slopes, moderately eroded	350	.1
Baile silt loam, 3 to 8 percent slopes	1,080	.4	Kelly very stony silt loam, 3 to 25 percent slopes	320	.1
Beltsville silt loam, 0 to 2 percent slopes	840	.3	Keyport silt loam, 0 to 2 percent slopes	280	.1
Beltsville silt loam, 2 to 5 percent slopes	2,050	.8	Keyport silt loam, 2 to 5 percent slopes	1,380	.6
Beltsville silt loam, 5 to 10 percent slopes	610	.3	Kinkora silt loam, 0 to 3 percent slopes	210	.1
Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded	500	.2	Kinkora silt loam, 3 to 8 percent slopes	170	.1
Brandywine gravelly loam, 15 to 25 percent slopes, severely eroded	570	.2	Legore silt loam, 3 to 8 percent slopes, moderately eroded	1,010	.4
Brandywine gravelly loam, 25 to 45 percent slopes, severely eroded	180	.1	Legore silt loam, 8 to 15 percent slopes, moderately eroded	1,110	.5
Chester silt loam, 0 to 3 percent slopes	320	.1	Legore silt loam, 15 to 25 percent slopes, moderately eroded	1,690	.7
Chester silt loam, 3 to 8 percent slopes, moderately eroded	23,765	9.8	Legore silt loam, 25 to 45 percent slopes	690	.3
Chester silt loam, 8 to 15 percent slopes, moderately eroded	5,920	2.5	Legore very stony silt loam, 0 to 15 percent slopes	310	.1
Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	4,330	1.8	Legore very stony silt loam, 15 to 25 percent slopes	650	.3
Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	3,220	1.3	Legore very stony silt loam, 25 to 45 percent slopes	680	.3
Chester gravelly silt loam, 15 to 25 percent slopes, moderately eroded	610	.3	Legore silty clay loam, 8 to 15 percent slopes, severely eroded	990	.4
Chillum silt loam, 2 to 5 percent slopes, moderately eroded	1,670	.7	Legore silty clay loam, 15 to 25 percent slopes, severely eroded	1,110	.5
Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded	630	.3	Leonardtown silt loam	440	.2
Chrome channery silty clay loam, 15 to 45 percent slopes	340	.1	Loamy and clayey land, 0 to 5 percent slopes	870	.4
Codorus silt loam	7,170	2.9	Loamy and clayey land, 5 to 15 percent slopes	1,660	.7
Comus silt loam	890	.4	Loamy and clayey land, 15 to 30 percent slopes	220	.1
Cut and fill land	680	.3	Manor loam, 3 to 8 percent slopes, moderately eroded	4,190	1.7
Delanco silt loam, 0 to 3 percent slopes	480	.2	Manor loam, 8 to 15 percent slopes, moderately eroded	4,820	2.0
Delanco silt loam, 3 to 8 percent slopes	2,140	.9	Manor loam, 8 to 15 percent slopes, severely eroded	1,340	.6
Elioak silt loam, 3 to 8 percent slopes, moderately eroded	1,840	.8	Manor loam, 15 to 25 percent slopes, moderately eroded	5,320	2.2
Elioak silt loam, 8 to 15 percent slopes, moderately eroded	570	.2	Manor loam, 15 to 25 percent slopes, severely eroded	3,230	1.3
Elkton silt loam	740	.3	Manor channery loam, 3 to 8 percent slopes, moderately eroded	1,330	.5
Elsinboro loam, 0 to 2 percent slopes	400	.2	Manor channery loam, 8 to 15 percent slopes, moderately eroded	5,090	2.1
Elsinboro loam, 2 to 5 percent slopes, moderately eroded	1,420	.6	Manor channery loam, 8 to 15 percent slopes, severely eroded	710	.3
Elsinboro loam, 5 to 10 percent slopes, moderately eroded	950	.4	Manor channery loam, 15 to 25 percent slopes, moderately eroded	5,310	2.2
Evesboro loamy sand, 5 to 15 percent slopes	100	(1)	Manor channery loam, 15 to 25 percent slopes, severely eroded	3,550	1.5
Fallsington loam	190	.1	Manor very stony loam, 25 to 45 percent slopes	750	.3
Glenelg loam, 3 to 8 percent slopes, moderately eroded	13,610	5.6	Manor soils, 25 to 45 percent slopes	7,530	3.1
Glenelg loam, 8 to 15 percent slopes, moderately eroded	14,490	6.0	Manor and Glenelg very stony loams, 3 to 15 percent slopes	1,500	.6
Glenelg loam, 8 to 15 percent slopes, severely eroded	1,220	.5	Manor and Glenelg very stony loams, 15 to 25 percent slopes	1,600	.7
Glenelg loam, 15 to 25 percent slopes, moderately eroded	2,850	1.2	Matapeake silt loam, 0 to 2 percent slopes	280	.1
Glenelg loam, 15 to 25 percent slopes, severely eroded	950	.4	Matapeake silt loam, 2 to 5 percent slopes	730	.3
Glenelg gravelly loam, 3 to 8 percent slopes, moderately eroded	2,200	.9	Mattapex silt loam, 0 to 2 percent slopes	870	.4
Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	5,880	2.4	Mattapex silt loam, 2 to 5 percent slopes	1,250	.5
Glenelg gravelly loam, 8 to 15 percent slopes, severely eroded	590	.2	Montalto silt loam, 0 to 3 percent slopes	300	.1
Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	2,960	1.2	Montalto silt loam, 3 to 8 percent slopes, moderately eroded	6,960	2.9
Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded	1,290	.5	Montalto silt loam, 8 to 15 percent slopes, moderately eroded	1,690	.7
Glenville silt loam, 0 to 3 percent slopes	2,200	.9	Neshaminy silt loam, 0 to 3 percent slopes	370	.2
			Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	7,940	3.3

See footnote at end of table.

TABLE 3.—*Approximate acreage and proportionate extent of soils*—Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	3,430	1.4	Sassafras and Joppa soils, 10 to 15 percent slopes	330	0.1
Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes	5,190	2.1	Sassafras and Joppa soils, 15 to 30 percent slopes	410	.2
Neshaminy and Montalto very stony silt loams, 15 to 25 percent slopes	1,280	.5	Stony land, steep	1,020	.4
Neshaminy and Montalto very stony silt loams, 25 to 45 percent slopes	630	.3	Swamp	140	(1)
Othello silt loam	410	.2	Tidal marsh	1,030	.4
Sand and gravel pits	570	.2	Watchung silt loam, 0 to 3 percent slopes	1,190	.5
Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	360	.1	Watchung silt loam, 3 to 8 percent slopes	2,200	.9
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	350	.1	Watchung very stony silt loam, 0 to 8 percent slopes	2,870	1.2
Sassafras loam, 2 to 5 percent slopes, moderately eroded	440	.2	Whiteford silt loam, 3 to 8 percent slopes	710	.3
Sassafras loam, 5 to 10 percent slopes, moderately eroded	410	.2	Whiteford silt loam, 8 to 15 percent slopes, moderately eroded	500	.2
			Woodstown loam, 0 to 5 percent slopes	240	.1
			Total area mapped	242,175	100.0
			Unmapped area (U.S. Military Reservation)	47,809	
			Total area in county	289,984	

[1] Less than 0.05 percent.

silt loam about 7 inches thick. The upper 7 inches of the subsoil is friable, dark yellowish-brown heavy silt loam. The next 10 inches is firm, yellowish-brown silty clay loam. These two layers are slightly sticky and plastic when wet. The lower part of the subsoil is a firm and brittle silty clay loam fragipan that extends to a depth of about 36 inches. The pan is yellowish brown mottled with light olive brown and strong brown in the upper 6 inches and light olive brown mottled with strong brown and yellowish brown in the lower 6 inches. The underlying material, which extends from a depth of 36 inches to 49 inches, is friable decayed serpentine rock of silt loam texture. It is mixed brown and olive in color. Serpentine bedrock is at a depth of about 49 inches.

Aldino soils are fairly easy to work at a favorable moisture content, except where they are too stony. They are commonly wet in spring and slow to warm up, however, so planting dates can be delayed. They are slowly permeable and in wet seasons have a perched water table above the fragipan. Available water capacity is moderate. In dry seasons, Aldino soils tend to dry out more quickly and thoroughly than soils that have a more permeable subsoil. These soils have moderate to severe limitations for many nonfarm uses.

Representative profile of Aldino silt loam, 3 to 8 percent slopes, in a cultivated field between Aldino-Stepney Road and Cassin Run Road, about one-fourth mile south of Aldino:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; many roots; very strongly acid; clear, wavy boundary.

B1—7 to 14 inches, dark yellowish-brown (10YR 4/4) heavy silt loam; weak, medium, subangular blocky structure; friable, slightly sticky and plastic; many roots; common, medium, distinct, black (10YR 2/1) iron-manganese concretions; very strongly acid; gradual, smooth boundary.

B2t—14 to 24 inches, yellowish-brown (10YR 5/4) silty clay loam; moderate, medium, subangular blocky structure; firm, slightly sticky and plastic; common roots; thick, continuous, grayish-brown (2.5Y 5/2) clay films on ped faces; common, medium, distinct, black (10YR 2/1) iron-manganese concretions; very strongly acid; clear, smooth boundary.

Bx1—24 to 30 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct, light olive-brown (2.5Y 5/6) and common, fine, prominent strong-brown (7.5YR 5/6) mottles; weak, very coarse, prismatic structure, and moderate, medium, platy structure; firm, brittle, slightly sticky and plastic; few roots between prisms and plates; discontinuous clay films; common, medium, distinct, black (10YR 2/1) iron-manganese concretions; strongly acid; gradual, smooth boundary.

Bx2—30 to 36 inches, light olive-brown (2.5Y 5/4) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) and few, fine, faint, yellowish-brown (10YR 5/4) mottles; moderate, very coarse, prismatic structure and strong, medium, platy structure; firm, brittle, sticky and plastic; discontinuous clay films; few, fine, faint, black (10YR 2/1) iron-manganese concretions; strongly acid; clear, smooth boundary.

IIC—36 to 49 inches, brown (10YR 5/3) mixed with olive (5Y 5/6) silt loam; massive; friable; few partly decomposed rock fragments; medium acid; abrupt, wavy boundary.

IIR—49 inches, serpentine bedrock.

The solum ranges from about 30 to 48 inches in thickness. Depth to bedrock is 3½ to 6 feet. Fine angular pebbles are in the C horizon in places. Some profiles are very stony. Reaction is very strongly acid to medium acid in the solum, and is strongly acid to neutral in the C horizon.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 3. A thin undisturbed A1 horizon less than 6 inches thick has the lowest value and chroma.

The B2t horizon has a hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 or 4. It is silty clay loam or heavy silt loam.

The Bx horizon or the fragipan, ranges in hue from 10YR to 5Y. Matrix value is 5 or 6 and chroma is 2 to 4. Mottling in the fragipan is in hue of 2.5Y to 7.5YR, value of 4 to 7, and chroma of 4 or 6. In places mottling with chroma of 2 is in the lower part. The Bx horizon is silt loam or silty clay loam.

The C horizon has a wide range in color and commonly is variegated, streaked, or banded. It is loam or silt loam.

Aldino soils resemble Beltsville soils in natural drainage and in having a fragipan. They contain more silt and less sand and are less strongly acid and shallower over bedrock than Beltsville soils. They are less acid and less micaceous than Glenville soils and are somewhat better aerated and less wet seasonally. They formed in the same general kind of material as the well-drained Chrome soils.

Aldino silt loam, 0 to 3 percent slopes (AdA).—This soil has a profile similar to the one described as representative of the series, but in some undisturbed areas, mostly woodland, the upper 1 or 2 inches of the surface layer is very dark grayish brown and the rest is brown. Included in mapping are a few areas where a small amount of the surface layer has been lost through erosion and spots where surface layer material has accumulated.

If drainage is improved, this soil is suited to most crops commonly grown. It is also suited to pasture and woodland. Such perennial crops as alfalfa are subject to damage by frost heaving in winter and early in spring. During rainy periods or periods of snowmelt, this soil is saturated quickly, because water penetrates slowly through the subsoil and does not run off readily from the surface. The soil thus remains wet for fairly long periods.

Drainage can be improved by shallow ditches or by tile lines.Ditches need not penetrate into the fragipan, and tile does not function properly if it is placed below the top surface of the fragipan. Bedding is needed to remove excess water in cultivated areas, and where the slope is slight, graded rows are needed to improve surface drainage. In places, diversion terraces can intercept and divert runoff water from adjacent areas. Capability unit IIw-2; woodland subclass 3o.

Aldino silt loam, 3 to 8 percent slopes (AdB).—This soil has the profile described as representative of the series. In some undisturbed areas, mostly woodland, the surface layer is very dark grayish brown in the upper 1 or 2 inches and brown in the rest. Included in mapping are areas where part of the original surface layer has been lost through erosion, and some spots where the subsoil is exposed or nearly so. Locally, there is some gravel in the upper part of the profile.

This soil is suited to most crops commonly grown, to pasture, and to woodland. Such perennial crops as alfalfa are subject to damage by frost heaving in winter and early in spring. The soil is seasonally wet and slow to warm up in spring. For most farm uses, the hazard of erosion generally is a more serious limitation than is impeded drainage, particularly if the soil is unprotected and already wet when rains are heavy.

Spot drainage is required in some cultivated areas. More important in most areas is the interception and disposal of seasonally excess surface water commonly by diversion terraces. Graded rows are needed to improve surface drainage and to check erosion. If the soil is not in row crops, it can be further protected by close-growing crops, cover crops, or accumulated crop residue. Capability unit IIe-14; woodland subclass 3o.

Aldino silt loam, 8 to 15 percent slopes (AdC).—This soil has a profile similar to the one described as representative of the series, but generally has a thinner surface layer and a thinner fragipan and is shallower over bedrock. Stones or boulders are in the subsoil in places. In some undisturbed areas, mostly woodland, the surface layer is very dark grayish brown in the upper inch, and brown in the rest. Included in mapping are areas where a part of the original surface layer has been lost through erosion, and some spots where shallow gullies have formed or where the subsoil is otherwise exposed, or nearly so.

The soil is suited to cultivated crops, but is limited because the hazard of erosion is severe. Cropping should be on the contour, in graded rows, where practical. The most common use in farming is pasture. Good pasture sod is excellent protection against erosion. The soil is also suited to woodland. Capability unit IIIe-14; woodland subclass 3r.

Aldino very stony silt loam, 0 to 8 percent slopes (AsB).—This soil has a profile similar to that described as representative of the series but stones, mostly of serpentine and larger than 10 inches in diameter, are about 5 to 30 feet apart on and near the surface. In the subsoil and the underlying material these stones are commonly larger and even more abundant. Serpentine bedrock outcrops in places.

This soil is suited to woodland. Cultivation is impractical unless most of the stones are removed. If some stones are removed, hay crops and pastures can be managed. Most areas of this soil are still wooded. Capability unit VIs-3; woodland subclass 3o.

Alluvial Land

Alluvial land (Av) consists of soil material washed from uplands and recently deposited on flood plains. Such deposition has been most extensive and rapid along streams that drain urban and suburban areas. The materials that make up Alluvial land are sands and sandy loams. Much of the finer material has been carried into stream estuaries.

Generally, Alluvial land is somewhat poorly drained to very poorly drained. Most of it is flooded two or more times a year. Where the watershed has been intensively developed, that is, under many roofs and much pavement, flooding is commonly even more frequent. Where the watershed is mostly in woods or pasture, flooding is not likely every year.

Alluvial land is seldom if ever cultivated. Most of it is woodland or is idle. Tree growth is generally good, but many of the wetter and most frequently flooded areas produce few trees of commercial value. This land makes suitable habitat for some kinds of wildlife. It has a unique ecology that should make it valuable as a nature study area within a densely populated region. Capability unit VIw-1; woodland subclass 2w.

Baile Series

The Baile series consists of deep, poorly drained, nearly level to gently sloping soils of the Piedmont Plateau. These soils formed partly in local alluvium and partly in underlying material weathered in place from micaceous rock. They are in upland depressions, on areas around the heads of drains, and on foot slopes adjacent to minor drainageways, many of which lack channels. The native vegetation is wetland hardwoods; cleared idle areas commonly support sedges, grasses, and herbs.

In a representative profile the surface layer is silt loam about 12 inches thick. It is dark grayish brown in the upper 6 inches, and grayish brown mottled with yellowish red in the lower 6 inches. The subsoil is about 28 inches thick. It is friable, dark-gray silt loam in the upper 6 inches and firm, gray to light-gray silty clay loam in the lower 22 inches. The subsoil is mottled with yellowish red and strong brown. It is sticky and plastic when wet. The underlying material from a depth of 40 to 64 inches is firm, light bluish-gray micaceous clay loam mottled with strong brown.

Baile soils generally are difficult to work because they are sticky when wet, or are hard and cloddy if a little too dry. They are seldom cultivated. The water table is seasonally at or very near the surface, and the soil is slow to warm up in spring. The soils are moderately slowly permeable to slowly permeable. If artificially drained by a system of ditches, they are suited to improved pasture. Drainage is slow and commonly is difficult. Available water capacity is high. Baile soils have severe limitations for most nonfarm uses.

Representative profile of Baile silt loam, 3 to 8 percent

slopes, in a sodded area west of Norrisville:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, faint mottles of brown (10YR 5/3); weak, fine, granular structure; friable, sticky and slightly plastic; many roots; medium acid; clear, smooth boundary.

A2g—6 to 12 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct mottles of yellowish red (5YR 4/6); very weak, fine, subangular blocky structure; friable, sticky and slightly plastic; common roots; medium acid; clear, smooth boundary.

B1g—12 to 18 inches, dark-gray (N 4/0) heavy silt loam; common, fine, distinct mottles of yellowish red (5YR 4/6); weak, fine, subangular blocky structure; friable, sticky and slightly plastic; few roots; strongly acid; clear, smooth boundary.

B21tg—18 to 26 inches, gray (N 5/0) silty clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6); weak, medium, subangular blocky structure; firm, sticky and plastic; very thin, discontinuous clay films; strongly acid; gradual, smooth boundary.

IIB22tg—26 to 40 inches, gray to light-gray (N 6/0) silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); firm, sticky and plastic; thin clay films; gritty; few, fine, angular pebbles; many mica flakes; strongly acid; clear, smooth boundary.

IICg—40 to 64 inches, light bluish-gray (5B 7/1) clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6); rock-controlled structure; firm, sticky and plastic; micaceous; very strongly acid.

The solum commonly formed in local alluvium and residuum, as described, but in places it formed entirely in alluvium. The solum ranges from about 30 to 40 inches in thickness and depth to bedrock ranges from about 5 to 10 feet. Stones or cobblestones of colluvial origin are present on and near the surface in places. Unless the soil is limed, reaction is strongly acid to extremely acid.

The A and B horizons have a hue of 10YR or yellower, or a neutral color. The A horizon has a value of 2 to 6 and chroma of 0 to 2. Only an A1 horizon that is less than 6 inches thick has a value of 2 or 3. Only the A2 horizon has a value of 5 or 6. In cultivated areas, the Ap horizon is gray to dark grayish brown.

The B horizon has matrix color that ranges in value from 4 to 6 and in chroma from 0 to 2. Mottles range in value from 4 to 6, in chroma from 4 to 8, and in hue from 10YR to 5YR. The Bt horizon is heavy silt loam, silty clay loam, or clay loam that is high in silt.

The C horizon has a matrix hue commonly greener or bluer than 5Y, but the range includes 5Y, or the color may be neutral. The C horizon is unmottled, or nearly so, in many places. It contains less clay than the B horizon. It is commonly loam, silt loam, or sandy loam, but is clay loam or sandy clay loam in places.

Baile soils resemble Elkton, Fallsington, Kinkora, Leonardtown, Othello, and Watchung soils in color and natural drainage. They have a less clayey B horizon than Elkton, Kinkora, and Watchung soils and a less sandy B horizon than Fallsington soils. They do not have a fragipan, which is typical of Leonardtown soils, and they are less silty and contain more mica than Othello soils. They are wetter than Glenville soils, which occupy similar positions and formed in the same general kind of material.

Baile silt loam, 0 to 3 percent slopes (BaA).—This soil has a profile similar to that described as representative of the series, but in some undisturbed areas, mostly woodland, the surface layer is very dark gray to black and is very thin. Included in mapping are small areas that have been filled or otherwise disturbed.

The soil is not only difficult to drain, but also difficult to work after drainage. It is sticky when wet, and becomes very hard when dry. The soil is seldom used for cultivated crops, even though it does not readily deteriorate in use. Permanent improved pasture and permanent hay generally are the most important farm uses. Many areas are woodland that is good habitat for some kinds of wildlife. Capability unit Vw-1; woodland subclass 1w.

Baile silt loam, 3 to 8 percent slopes (BaB).—This soil has the profile described as representative of the series. Included with it in mapping are small areas that are somewhat eroded and small depressions in which silty soil material has accumulated.

The soil takes up water very slowly, so most rainfall and snowmelt tend to run off, creating a significant hazard of erosion where the soil has been cleared for use. Wetness and poor drainage, however, are the major limitations. Hay or improved pasture can be produced, but the soil generally is better suited to woodland and to wildlife habitat. Capability unit VIw-2; woodland subclass 1w.

Beltsville Series

The Beltsville series consists of moderately well drained, nearly level to moderately sloping soils on uplands of the Coastal Plain. These soils are only moderately deep over a fragipan. They formed in loamy sediment deposited over very old loamy or gravelly deposits. The native vegetation is largely scrub-type upland oaks and other hardwoods and some Virginia pine.

In a representative profile the surface layer is brown silt loam about 9 inches thick. In wooded areas the uppermost part is dark gray to very dark gray, or black. The upper 7 inches of the subsoil is friable, yellowish-brown silt loam. The next 11 inches is firm, yellowish-brown silty clay loam. The lower part of the subsoil is a very firm and dense, yellowish-brown fragipan that extends to a depth of about 42 inches. This fragipan, which has distinct strong-brown mottles, is light silty clay loam in the upper 8 inches and heavy silt loam in the lower 7 inches. From a depth of 42 to 60 inches the underlying material is light brownish-gray, firm gravelly loam.

Beltsville soils are fairly easy to work at a favorable moisture content. They are commonly wet in spring and slow to warm up, so planting dates can be delayed. They are slowly permeable, and in wet seasons they have a perched water table above the fragipan. Available water capacity is moderate. In dry seasons, they tend to dry out more quickly and thoroughly than soils that have a more permeable subsoil. Cleared areas are used for crops or pasture. They have moderate to severe limitations for many nonfarm uses.

Representative profile of Beltsville silt loam, 2 to 5 percent slopes, in a cultivated area just off U.S. Highway 40, 3 miles northeast of Aberdeen:

Ap—0 to 9 inches, brown (10YR 5/3) silt loam; moderate, medium, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

B1—9 to 16 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; friable, slightly sticky; many roots; strongly acid; gradual, smooth boundary.

B2t—16 to 27 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, distinct mottles of reddish brown (5YR 5/4); moderate, medium, subangular blocky structure; firm, sticky and plastic; common roots; strong-brown (7.5YR 5/6) continuous clay films; very strongly acid; clear, smooth boundary.

Bx1—27 to 35 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6); strong, very coarse, prismatic and strong, medium, platy structure; very dense and compact, very firm and brittle, sticky and plastic; distinct, strong-brown (7.5YR 5/8), and yellowish-brown (10YR 5/8) clay films, thicker on vertical than horizontal faces; extremely acid; gradual, irregular boundary.

Bx2—35 to 42 inches, yellowish-brown (10YR 5/6) heavy silt loam; few, fine, distinct mottles of strong brown (7.5YR 5/8); strong, very coarse, prismatic and strong, medium, platy structure; very firm, brittle, sticky and plastic; gritty; prominent strong-brown (7.5YR 5/6) clay films; extremely acid; clear, wavy boundary.

IIC—42 to 60 inches, light brownish-gray (10YR 6/2) gravelly loam; massive; hard, firm when moist or wet, but becoming friable with increasing depth; 10 to 20 percent pebbles; many pebbles coated; extremely acid.

The solum ranges from about 40 to 64 inches in thickness. Depth to the fragipan ranges from about 20 to 34 inches. Bedrock is at an undetermined great depth. Fine pebbles are in the solum in many places and are common to abundant in the IIC horizon. Unless the soil is limed, reaction is very strongly acid to extremely acid.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 7, and chroma of 2 to 6. Only an A1 horizon that is less than 6 inches thick has a value of 3. Only the A2 horizon, if present, has a value of 7 and chroma of 6.

The B horizon has hues of 2.5Y or 10YR. In places the lower part is 7.5YR. Values range from 4 to 6 and chromas from 3 to 6. High-chroma mottles are in many places and low-chroma mottles are in the Bx horizon in places. The B horizon generally is silt loam or silty clay loam, but is loam or clay loam, in part, in places.

The IIC horizon ranges in color from light brownish gray to very pale brown or is variegated with many colors. It ranges from sandy loam to clay loam and most commonly is gravelly.

Beltsville soils resemble Aldino soil in natural drainage and in having a fragipan, but contain more sand and less silt in the solum. They are more strongly acid and much deeper over bedrock than Aldino soils. They are not so micaceous as the Glenville soils, are somewhat better drained and less wet seasonally, and are deeper to bedrock. They formed in the same general kind of sediment as the well drained Chillum and Matapeake soils, the moderately well drained Mattapex soils, which have no fragipan, and the poorly drained Leonardtown and Othello soils.

Beltsville silt loam, 0 to 2 percent slopes (BeA).—The profile of this soil is like that described as representative of the series, but the subsoil, especially the fragipan, commonly is somewhat thicker. Included with this soil in mapping are a few acres where the surface layer is a little more sandy and less loamy than described. A few small areas have been filled, graded, or otherwise disturbed.

This soil is nearly level, and the hazard of erosion only slight. The soil quickly becomes saturated above the fragipan during heavy rains or snowmelts. It normally remains wet for a fairly long period, because runoff and permeability are slow. Artificial drainage is needed for most crops and for other uses. Tile drains or bottoms of drainage ditches should not be placed below the top of the fragipan.

This soil is suited to most crops, particularly those that need not be planted early. Such perennial crops as alfalfa can be damaged by frost heaving in winter and early in spring. Capability unit IIw-8; woodland subclass 3w.

Beltsville silt loam, 2 to 5 percent slopes (BeB).—This soil has the profile described as representative of the series. Included with it in mapping are a few acres where the surface layer is a little more sandy and less loamy than described, spots where the surface layer contains some fine smooth gravel, and a few galled spots and shallow gullies. Some small areas have been graded or otherwise disturbed.

The hazard of erosion is moderate. This generally is more important in management than is drainage improvement. A suitable rotation, especially in strips, is effective in conserving soil. The surface should be protected between crop seasons by cover crops or by crop residues. Spot drainage is needed in some cropped areas. More important in most areas is the collection and disposal of seasonally excess surface water, commonly by interceptors or diversions with sodded waterways. Graded rows are needed to improve surface drainage and to help check erosion.

The soil is suited to most crops, particularly those that need not be planted early. Such perennial crops as alfalfa can be damaged by frost heaving in winter and early in spring. Capability unit IIe-13; woodland subclass 3w.

Beltsville silt loam, 5 to 10 percent slopes (BeC).—In most areas this soil has not been cultivated intensively, so it has not been greatly affected by erosion. The hazard of erosion is severe if the soil is regularly tilled. Included in mapping are areas where the surface layer is a little more sandy and less loamy than described for the representative profile. Also included are spots where the surface layer contains some fine smooth gravel, a few galled spots and shallow gullies, and small areas where the slope is more than 10 percent.

Erosion control is more important in management than is drainage improvement. Cropping should be on the contour, in graded rows, where practical, and alternate strips. The surface should be protected between crop seasons by cover crops or by crop residues. The most common farm use is pasture. Good pasture sod is an excellent protection against erosion. Spot drainage is needed in some cropped areas. Capability unit IIIe-13; woodland subclass 3w.

Brandywine Series

The Brandywine series consists of deep, somewhat excessively drained to excessively drained, moderately sloping to steep soils of the Piedmont Plateau. These soils formed in gravelly material weathered in place from gneiss. They are on sides and crests of some of the steeper hills of the Harford County Area. The native vegetation is oaks, other hardwoods, and Virginia pine.

In a representative profile the surface layer is brown gravelly loam about 7 inches thick. The subsoil is yellowish-brown, friable gravelly loam about 12 inches thick. The underlying material, which extends from a depth of 19 inches to 72 inches, consists largely of very friable very gravelly coarse sand. Hard gneiss bedrock is at a depth of about 72 inches.

Brandywine soils are easy to work, but the hard angular gravel is abrasive to most farm implements. These soils are moderately rapidly permeable and have a low available water capacity. The hazard of erosion is severe to very severe, and most areas of Brandywine soils in the Harford County Area are already severely eroded. Seasonal droughtiness is a limitation for farm uses. Brandywine soils are moderately to severely limited for many nonfarm uses, chiefly because of slope.

Representative profile of Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded, in an idle area on Sandy Hook Road, about one-fourth mile west of U.S. Highway 1:

Ap—0 to 7 inches, brown (10YR 5/3) gravelly loam; moderate, fine, granular structure; very friable; many roots; about 20 percent angular rock fragments, mostly about ¼ inch in diameter; strongly acid; abrupt, smooth boundary.

B2—7 to 19 inches, yellowish-brown (10YR 5/4) gravelly loam; weak, medium, subangular blocky structure; friable; common roots; about 50 percent angular rock fragments, mostly less than ¼ inch in diameter; very strongly acid; abrupt, irregular boundary.

C—19 to 72 inches, very pale brown (10YR 7/4) very gravelly coarse sand; single grained; very friable; very few roots, in upper part only; about 60 percent angular rock fragments of as much as ½ inch in diameter; very strongly acid; abrupt, irregular boundary.

R—72 inches, hard, fractured gneiss.

The solum ranges from about 12 to 30 inches in thickness. Depth to solid bedrock ranges from about 4 feet to 10 feet, but generally is at least 6 feet. Unless the soil is limed, reaction is strongly acid to extremely acid, and acidity commonly increases with increasing depth.

The solum has a hue of either 10YR or 7.5YR. The A horizon has color value of 3 to 5 and chroma of 1 to 4. Only an undisturbed A1 horizon less than 3 inches thick has a value of 3.

The B horizon has a value of 5 or 6 and chroma of 4 or 6. This horizon is moderately gravelly to highly gravelly. In places the B horizon is so weakly expressed that it is difficult to observe and define.

The C horizon has a hue of 10YR or 5Y and commonly higher value than in the B horizon. It can be of uniform color, as described, or highly variegated. It is always highly gravelly and in places is stony or bouldery.

Brandywine soils do not closely resemble any other soils of the Harford County Area. They are closely associated with the highly micaceous Manor soils, but contain more coarse fragments and have a lower available water capacity.

Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded (BrC2).—This soil has the profile described as representative of the series. A large part of the original surface layer has been removed by erosion. Included in mapping are some severely eroded spots, a few shallow gullies, and a few acres where the surface layer contains less gravel than is typical.

The hazard of continued erosion is severe if the soil is tilled. Droughtiness is an additional, though less important, concern. If slopes are long enough, contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving both soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is suited to hay and pasture and is particularly well suited to sodded orchards. It is also well suited to woodland and to some types of wildlife habitat. Capability unit IIIe-10; woodland subclass 3f.

Brandywine gravelly loam, 15 to 25 percent slopes, severely eroded (BrD3).—Erosion on this soil has removed all or nearly all of the original surface layer in most places, and shallow to deep gullies are common. Included in mapping are small areas where the soil contains less than the usual amount of gravel. In other places, however, and particularly in rills and gullies, accumulations of gravel almost pave the surface.

This soil generally is not suited to cultivated crops. It is suited to pasture, sodded orchards, woodland, and wildlife habitat. Capability unit VIe-3; woodland subclass 3f.

Brandywine gravelly loam, 25 to 45 percent slopes, severely eroded (BrE3).—This soil is so severely eroded that it is of little use in farming. In most places it has a blanket of gravel on the surface that was left behind when the finer soil material washed away.

The soil can be used for limited grazing, but only under careful protective management. More suitable uses are woodland, wildlife habitat, and outdoor recreation. Capability unit VIIe-3; woodland subclass 3f.

Chester Series

The Chester series consists of deep, well-drained, nearly level to strongly sloping soils of the Piedmont Plateau. These soils formed in materials deeply weathered in place from acid crystalline rocks, most commonly mica schist, or other rocks containing much mica. They are on broad ridgetops and adjacent upper slopes. The native vegetation is mixed upland oaks and a variety of other hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 9 inches thick. The upper 10 inches of the subsoil is brown to dark-brown, firm light silty clay loam that is sticky when wet. The lower 21 inches is yellowish-red and reddish-brown, friable silt loam that is slightly sticky when wet. The underlying material from a depth of 40 inches to 60 inches is light-brown, friable, disintegrated micaceous rock of fine sandy loam texture.

Chester soils are easy to work at a favorable moisture content. In places they contain hard quartzite gravel that is abrasive to farm implements. These soils are moderately permeable and have high available water capacity. Slope is the major limitation for both farm and nonfarm uses. The hazard of erosion in all sloping areas is moderate to severe.

Representative profile of Chester silt loam, 3 to 8 percent slopes, moderately eroded, in a cultivated area on Grier Nursery Road near Cherry Hill:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable, slightly sticky; many roots; slightly acid; abrupt, smooth boundary.

B21t—9 to 19 inches, brown to dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; common roots; reddish-brown (5YR 4/4) clay films; medium acid; gradual, smooth boundary.

B22t—19 to 30 inches, yellowish-red (5YR 5/6) heavy silt loam; moderate, fine, subangular blocky structure; friable, slightly sticky; few roots; yellowish-red (5YR 4/8) clay films; strongly acid; gradual, wavy boundary.

B3—30 to 40 inches, reddish-brown (5YR 5/4) silt loam; weak, medium, blocky structure; friable, slightly sticky; very few roots; very strongly acid; clear, irregular boundary.

C—40 to 60 inches, light-brown (7.5YR 6/4) fine sandy loam; massive; friable; many mica flakes; many soft, fine fragments of mica schist; very strongly acid.

The solum ranges from about 30 to 50 inches in thickness. The lower boundary of the Bt horizon ranges from 30 to 40 inches below the surface. Depth to bedrock ranges from about 5 feet to 10 feet. Unless the soil is limed, reaction is strongly acid or very strongly acid, and acidity commonly increases with increasing depth.

The A horizon, has a hue of 10YR or 7.5YR, value of 3 to 5 and chroma of 1 to 4. Only an undisturbed A1 horizon has a value of 3 and chroma of 1.

The B horizon has a hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 8. It is heavy loam, silt loam, clay loam, or silty clay loam.

The C horizon is saprolite. In places it is a single reddish to brown color, but in many places it is banded or variegated with two or more colors. It is micaceous and ranges from sandy loam to heavy loam.

Chester soils resemble Elsinboro, Glenelg, Matapeake, and Sassafras soils. They are not stratified like Elsinboro soils. They generally have a thicker solum and are less micaceous than Elsinboro and Glenelg soils and are less deep over bedrock and are more micaceous than Matapeake and Sassafras soils. They formed in the same general kind of micaceous material as Elioak, Glenelg, Glenville, and Manor soils. They are less red and less clayey than Elioak soils, are better drained than Glenville soils, and contain more clay in the B horizon and have a thicker solum than Manor soils.

Chester silt loam, 0 to 3 percent slopes (CcA).—This soil has a profile similar to that described as representative of the series, but it has a thicker surface layer and generally a somewhat thicker subsoil.

The soil is well suited to all crops commonly grown in the county. It has no major limitations for farming. The hazard of erosion is slight. Good management includes the application of fertilizer, lime, and manure; minimum tillage; and the use of a cover crop or crop residue to protect the surface in winter. Capability unit I-4; woodland subclass 2o.

Chester silt loam, 3 to 8 percent slopes, moderately eroded (CcB2).—The profile of this soil is the one described as representative of the series. In most areas this soil has lost a little of the original surface layer through erosion. Included in mapping are a few more severely

eroded spots and gullies. Also included are local accumulations of loamy soil material at the bases of slopes and in slight depressions.

This is an excellent soil for farming, the only limitation to which is the moderate hazard of further erosion. The soil can be protected from further erosion damage by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff. In winter the surface should be protected by a cover crop or by crop residues left in place. Capability unit IIe-4; woodland subclass 2o.

Chester silt loam, 8 to 15 percent slopes, moderately eroded (CcC2).—In most areas this soil has had 3 to 8 inches of its original surface layer eroded away, and scattered shallow gullies have formed. Included in mapping are local accumulations of loamy soil material at the base of slopes.

The hazard of further erosion is severe if this soil is tilled regularly without the intense application of soil-conserving measures. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving both soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is also well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2o.

Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded (CgB2).—This soil has a profile similar to that described as representative of the series, but the surface layer and the subsoil contain many small rock fragments. These are both angular fragments of hard white quartzite and flattened fragments of mica schist and related rocks. Most areas of this soil have already lost a little of the original surface layer, and there are shallow gullies and galled spots in places. Included in mapping are areas where the slope is less than 3 percent.

The hard gravel fragments are abrasive to farm machinery and can hinder the preparation of a good seedbed. The major limitation is the moderate hazard of further erosion. Fairly simple, easily applied soil-conserving measures are needed to protect the soil from further erosion damage. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff. The surface needs to be protected by a cover crop or by crop residues between growing seasons. Capability unit IIe-4; woodland subclass 2o.

Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded (CgC2).—On this soil, rock fragments have been exposed on the surface by plowing and cultivating. These fragments, which accumulate in furrows, rills, and shallow gullies and on the lower parts of slopes, are abrasive to farm implements. The hazard of further erosion is severe if the soil is tilled regularly and unless intensive soil-conserving measures are applied. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving both soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2o.

Chester gravelly silt loam, 15 to 25 percent slopes, moderately eroded (CgD2).—The profile of this soil is thinner than that of less strongly sloping Chester soils. A large part of the original surface layer has been removed by erosion, and some shallow gullies have formed in which gravel accumulates. Included in mapping are a few acres where many of the coarse fragments are slate chips.

The hazard of further erosion is severe if the soil is tilled and unless intensive, specialized soil-conserving measures are applied and maintained. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used. Even under the best management, this soil generally is unsuited to cultivated crops. It is better suited to hay, pasture, sodded orchards, or woodland. Capability unit IVe-3; woodland subclass 2r.

Chillum Series

The Chillum series consists of well-drained, gently sloping to moderately sloping soils of the Coastal Plain. These soils are only moderately deep over a hard, commonly gravelly substratum that restricts penetration of most plant roots. They formed in loamy material deposited over older, commonly gravelly sediments. They are on uplands that are either broad and smooth or somewhat hummocky. In hummocky areas, slopes are short. The native vegetation is oak and other upland hardwoods, Virginia pine, and a ground cover of acid-tolerant shrubs.

In a representative profile the surface layer, about 10 inches thick, is silt loam that is very dark grayish brown in the upper 2 inches and brown to dark brown in the lower 8 inches. In cultivated areas the plow layer is commonly dark grayish brown. The subsoil, about 20 inches thick, is mainly yellowish-brown, friable silty clay loam in the upper 9 inches and strong-brown, firm silty clay loam in the lower 11 inches. The underlying material from a depth of 30 inches to 40 inches is yellowish-red, firm gravelly sandy clay loam and from a depth of 40 inches to 54 inches is mostly yellowish-red, friable loam.

Chillum soils are easy to work if the moisture content is favorable. They are moderately permeable and have a moderate to high available water capacity. In dry seasons they tend to dry more quickly and more completely than other well-drained, moderately permeable soils of the survey area. In addition, they are limited for both farm and nonfarm uses by slope and the hazard of erosion.

Representative profile of Chillum silt loam, 2 to 5 percent slopes, moderately eroded, in a wooded area on north side of U.S. Highway 40, near western city limits of Havre de Grace:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

A2—2 to 10 inches, brown to dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable, slightly sticky; many roots; strongly acid; clear, wavy boundary.

B1—10 to 13 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, fine, subangular blocky structure; friable, slightly sticky; common roots; very strongly acid; clear, wavy boundary.

B21t—13 to 19 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; strong-brown (7.5YR 5/6) discontinuous clay films; very strongly acid; gradual, wavy boundary.

B22t—19 to 30 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; few roots; distinct clay films; very strongly acid; clear, wavy boundary.

IIC1—30 to 40 inches, yellowish-red (5YR 4/6) gravelly sandy clay loam; massive; hard, firm; about 30 percent rounded pebbles as much as 2 inches in diameter; very strongly acid; abrupt, smooth boundary.

IIIC2—40 to 54 inches, yellowish-red (5YR 4/6) loam variegated with brown and gray; massive; friable; micaceous; strongly acid.

The solum ranges from 20 to 30 inches in thickness. Bedrock is at an undetermined great depth. The solum is essentially free of coarse fragments, but the IIC horizon is commonly 10 to 30 percent quartz pebbles as much as 2 inches in diameter. Unless the soil is limed, reaction is strongly acid to extremely acid.

The A horizon has a value of 3 to 5 and a chroma of 2 to 4; only the thin A1 horizon has a value of 3. The B horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. It is silt loam or silty clay loam. In places a thin gravelly or sandy transitional B3 horizon is between the Bt and the IIC horizons. The IIC horizon varies widely in color and in many places is variegated. It is characteristically gravelly, sandy, hard, and firm. The micaceous IIIC horizon described in the representative profile is not characteristic of Chillum soils in most survey areas.

In contrast with Matapeake soils, Chillum soils formed in thinner deposits of highly silty material and have a less friable, more gravelly IIC horizon. They are better drained than Beltsville, Mattapex, Leonardtown, and Othello soils, which also formed in a mantle of highly loamy material on the Coastal Plain.

Chillum silt loam, 2 to 5 percent slopes, moderately eroded (ChB2).—This soil has the profile described as representative of the series. Included in mapping are a few acres where the surface layer is more sandy and less silty than is typical, some moderately eroded spots, some areas where a little fine gravel is on or near the surface, and a few small areas where the slope is less than 2 percent.

The hazard of further erosion is moderate. Depth to the underlying gravelly layer, which ranges from about 20 inches to 30 inches, is as important in soil management as the erosion hazard. This hardened layer restricts the roots of many deep-rooted crops and increases the need for erosion control. Also, if depth over the hard layer is much less than 30 inches, the available water capacity is no more than moderate. Some crops lack sufficient moisture in long seasons of less than normal rainfall.

Farming on the contour, using buffer strips at fairly narrow intervals, is effective in checking soil and water losses. Also, minimum tillage is needed. Using all available crop residue, as well as animal and green manures, improves the moisture-holding potential of the soil. Under such management, this soil is suited to most crops, as well as to pasture, orchards, and woodland. Capability unit IIs-7; woodland subclass 3o.

Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded (CkC2).—This mapping unit is about two-thirds Chillum silt loam and about one-third Neshaminy silt loam. The Chillum silt loam has a profile similar to the one described as representative of the Chillum series, but is somewhat shallower, on the average, over the gravelly substratum. The Neshaminy silt loam has little or no loamy mantle. It formed in residuum weathered from such semibasic rock as granodiorite, or a mixture of dark-colored basic rock and light-colored acid rock.

Included in mapping are a number of galled spots, some shallow gullies, some small areas where little gravel is on or near the surface, and a few areas where the slope is slightly greater than 10 percent.

The hazard of further erosion is severe. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Conserving moisture is particularly important on the Chillum soil. Using all available crop residue, as well as animal and green manures, improves the moisture-holding potential. Also, minimum tillage is needed. Under such management, these soils are suited to most crops, as well as to pasture, sodded orchards, and woodland. Capability unit IIIe-7; woodland subclass 3o.

Chrome Series

The Chrome series consists of well-drained, strongly sloping to steep soils of the Piedmont Plateau. These soils are moderately deep over hard serpentine bedrock. They formed in the weathered products of serpentine bedrock. They are on the sides of high ridges, mostly in the north-central part of the survey area. The native vegetation chiefly is scrub-type oaks, and some redcedar, Virginia pine, and shortleaf pine.

In a representative profile the surface layer is dark grayish-brown channery silty clay loam about 6 inches thick. The subsoil, about 10 inches thick, is firm, brown to dark brown channery heavy silty clay loam and silty clay that is sticky to very sticky and plastic to very plastic when wet. The underlying material, from a depth of 16 inches to 20 inches, is firm, dark yellowish-brown channery silty clay that is very sticky when wet. Hard serpentine bedrock is at a depth of 20 inches.

Some Chrome soils are stony, and all are difficult to work. Some areas have been cultivated in the past, but this resulted in severe erosion, and few if any areas are now cropped. These soils are moderately permeable and have low to moderate available water capacity. Slope and the restricted depth to bedrock severely limit them for nearly all uses.

Representative profile of Chrome channery silty clay loam, 15 to 45 percent slopes, in an idle area on Cherry Hill Road:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) channery silty clay loam; weak, fine, granular structure; friable, sticky; many roots; about 20 percent flat fragments of serpentine; strongly acid; clear, smooth boundary.

B21t—6 to 11 inches, brown to dark-brown (7.5YR 4/4) channery heavy silty clay loam; weak, medium, blocky structure; firm, stocky and plastic; common roots; thin, almost continuous clay films; about 15 percent flat fragments of serpentine; slightly acid; clear, wavy boundary.

B22t—11 to 16 inches, brown or dark-brown (10YR 4/3) channery silty clay; moderate, medium, blocky structure; firm, very sticky and very plastic; few roots; brown or dark-brown (7.5YR 4/4) discontinuous clay films; about 25 percent flat fragments of serpentine; slightly acid; clear, irregular boundary.

C—16 to 20 inches, dark yellowish-brown (10YR 4/4) channery silty clay; massive; firm, plastic and very sticky; very few roots; about 30 percent irregular fragments of serpentine, fragments heavily coated; slightly acid; abrupt, irregular boundary.

R—20 inches, hard serpentine.

The solum ranges from about 10 to 20 inches in thickness. Depth to bedrock ranges from about 20 to 40 inches. Content of coarse flat fragments of serpentine range from about 15 to 30 percent in the solum and from about 15 to 80 percent in the C horizon. Some areas are very stony. Reaction is strongly acid to neutral in the A horizon and is slightly acid or neutral in B and C horizons. The exchange complex is dominated by magnesium. The B horizon is extremely high in nickel. Studies of B horizons of Chrome soils in neighboring Baltimore County show nickel contents ranging from 1,200 to 2,700 parts per million.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 4. Only an A1 horizon less than 3 inches thick has the

Figure 6.—**Sparse stand of Virginia pine on highly eroded Chrome channery silty clay loam.**

lowest value and chroma. If present, only the A2 horizon has the highest value and chroma. The A horizon is silt loam or silty clay loam.

The B horizon has a hue of 7.5YR or 10YR and value and chroma of 3 or 4. This horizon is heavy clay loam, heavy silty clay loam, or silty clay.

In most places, the C horizon is similar to the B horizon in color and texture. In places, however, it is variegated and has higher values and chromas than does the B horizon.

Chrome soils do not closely resemble other soils of the Harford County Area; no other classified soils are as shallow over bedrock. These soils formed in the same general kind of material as the moderately well drained Aldino soils.

Chrome channery silty clay loam, 15 to 45 percent slopes (CrE).—This soil is on the sides of high ridges. Included in mapping are a few areas where the slope is more than 45 percent and small areas where the surface layer has been severely eroded. Also included are outcrops of bedrock.

Slope and the moderate depth to bedrock make this soil unsuited to farming. It is suited to woodland, which furnishes wildlife habitat and watershed protection, but tree growth is slow (fig. 6). Capability unit VIIs-32; woodland subclass 4c.

Codorus Series

The Codorus series consists of deep, moderately well drained to somewhat poorly drained, nearly level soils on flood plains, mainly on the Piedmont Plateau. Some areas extend along major streams into the Coastal Plain. These soils formed in dominantly loamy recent alluvium that originally washed from areas of soils that formed chiefly in material weathered from crystalline rocks. The native vegetation is mixed hardwoods that tolerate wetness.

In a representative profile the surface layer is dark grayish-brown silt loam about 10 inches thick. The upper 30 inches of the subsoil is friable, yellowish-brown silt loam that is slightly sticky when wet. It is mottled with grayish colors below a depth of about 20 inches. The lower 8 inches is firm, grayish-brown light silty clay loam that has some dark reddish-brown mottling. It is slightly sticky when wet. The underlying material, from a depth of 48 inches to 54 inches, is grayish-brown, mottled, stratified loam and silt loam that is highly micaceous.

Codorus soils are fairly easy to work if the moisture content is favorable, but they are commonly wet in spring and fairly slow to warm up. They are subject to flooding, particularly in spring. Spring plowing and planting therefore generally are delayed. These soils are moderately permeable and have a high available water capacity. Where drainage and protection against flooding are adequate, they are suited to most farm uses. Codorus soils have moderate to severe limitations for most nonfarm uses.

Representative profile of Codorus silt loam, in an improved pasture on the flood plain of Deer Creek:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; very friable; many roots; neutral; clear, smooth boundary.

B1—10 to 20 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; visible mica flakes; medium acid; clear, smooth boundary.

B2—20 to 40 inches, yellowish-brown (10YR 5/4) silt loam; many, fine, distinct mottles of grayish brown (2.5Y 5/2) and common, fine, distinct mottles of strong brown (7.5YR 5/6); very weak, coarse, blocky structure; friable, slightly sticky; very few roots; common mica flakes; strongly acid; abrupt, wavy boundary.

B3—40 to 48 inches, grayish-brown (10YR 5/2) light silty clay loam; many, fine, distinct mottles of dark reddish brown (5YR 3/3); very weak, thin, platy structure; firm, slightly sticky and slightly plastic; many mica flakes; strongly acid; clear, wavy boundary.

IIC—48 to 54 inches, grayish-brown (2.5Y 5/2) stratified loam and silt loam; many, medium, distinct mottles of brown or dark brown (7.5YR 4/4); friable, slightly sticky; highly micaceous; strongly acid.

The solum ranges from about 42 to 60 inches in thickness. Depth to bedrock ranges from 6 feet to more than 10 feet. Bedrock at a depth of less than 10 feet most commonly is mica schist. Smooth waterworn pebbles are present in places, but are seldom abundant except in the IIC horizon. The presence of mica is characteristic of the series, but the content in the solum is variable. Unless the soil is limed, reaction is strongly acid or very strongly acid.

The A horizon has a color value of 3 to 5 and chroma of 1 to 4. Only an A1 horizon less than 4 inches thick has a value of 3.

The B horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Only the thin, transitional B3 horizon has a chroma of 2. Mottles in the B horizon are in hue 2.5Y to 5YR. Mottles with chroma of 2 or less are characteristic of the B2 horizon, and high-chroma mottles are in all parts of the B horizon in places. The B horizon is silt loam or silty clay loam.

The IIC horizon has the same color range as the B horizon. It is unmottled in places. This horizon consists of a much earlier deposit of sediment than does the solum. It is stratified, and in many places it is distinctly coarser in texture than the solum.

Codorus soils do not closely resemble any other soils of the Harford County Area. They formed in the same kind of sediment, on flood plains, as the well-drained Comus soils and the poorly drained Hatboro soils.

Codorus silt loam (Cu).—In most areas this soil is nearly level. Included in mapping are a few acres where the slope is slightly more than 3 percent, and places where little or no mica is evident throughout the soil.

The hazard of flooding varies. It can be predicted only by knowing the history of the particular flood plain. Where drainage is improved and the hazard of flooding is no more than moderate, the soil is suited to annual row crops. If outlets are adequate, either tile lines or ditches generally are effective for drainage. Areas subject to severe or frequent flooding generally are not drained, but can be used for seasonal pasture or for woodland. Even in drained areas such perennial crops as alfalfa are subject to damage by flooding and by frost heaving in winter and spring. Capability unit IIw-7; woodland subclass 1w.

Comus Series

The Comus series consists of deep, well-drained, nearly level soils on flood plains, mainly on the Piedmont Plateau. Some areas extend along major streams onto the Coastal Plain. These soils formed in dominantly loamy recent alluvium that originally washed from areas of soils that formed chiefly from crystalline rocks. The native vegetation is mixed hardwoods, including many oaks, black walnut, hickory, beech, and elm.

In a representative profile the surface layer is brown or dark-brown silt loam about 12 inches thick. The subsoil, about 22 inches thick, is brown to dark-brown and strong-brown, friable silt loam that contains much mica. The underlying material to a depth of 60 inches is strong-brown gravelly sandy loam that is highly micaceous.

Comus soils are fairly easy to work if the moisture content is favorable. Wetness is not a limitation except for occasional flooding, particularly in spring. The soils are moderately permeable and have a high available water capacity. Except for the hazard of flooding, they have few, if any, limitations.

Representative profile of Comus silt loam, in an idle area on the flood plain of Winters Creek, south of U.S. Highway 40:

Ap—0 to 12 inches, brown or dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; common mica flakes; medium acid; gradual, smooth boundary.

B21—12 to 21 inches, brown or dark-brown (7.5YR 4/4) silt loam; weak, coarse, granular structure to fine, subangular blocky; friable, slightly sticky and slightly plastic; common roots; many mica flakes; medium acid; gradual, wavy boundary.

B22—21 to 34 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure; friable, sticky and slightly plastic; few roots in upper part; micaceous; strongly acid; clear, smooth boundary.

IIC—34 to 60 inches, strong-brown (7.5YR 5/6) gravelly sandy loam; single grained; friable to loose; highly micaceous; about 20 percent waterworn pebbles; strongly acid.

The solum ranges from about 24 to 40 inches in thickness. Depth to bedrock ranges from 6 feet to more than 10 feet. Bedrock at a depth of less than 10 feet most commonly is mica schist. Smooth waterworn pebbles are in many places, but seldom are abundant except in the IIC horizon. Content of mica is characteristic of the series, but mica content in the solum is variable. Unless the soil is limed, reaction is strongly acid or very strongly acid.

The A horizon has a hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 1 to 4. Only an A1 horizon less than 4 inches thick has the lowest value and chroma.

The B horizon has a hue of 10YR or 7.5YR, or 5YR in a minor subhorizon; the value is 4 or 5 and the chroma is 4 or 6 in a few places. This horizon is silt loam, or loam that is high in silt.

The IIC horizon is similar to the B horizon in color, but in some places it has a higher value and chroma, or faint low-chroma mottling at depths below 40 inches, or both. Compared to the solum, this horizon is a much earlier deposit of sediment, is characteristically coarser textured, and in many places is stratified.

Comus soils do not closely resemble any other soils in the Harford County Area. They formed in the same kind of sediment, on flood plains, as the somewhat poorly drained to moderately well drained Codorus soils and the poorly drained Hatboro soils.

Comus silt loam (Cv).—Most areas of this soil are nearly level. Included in mapping are a few areas where the slope is slightly more than 3 percent.

During seasons of high water the soil is flooded in places. The hazard of flooding can be predicted only by knowing the history of the particular flood plain. Where the hazard of flooding is no more than moderate, the soil is well suited to crops commonly grown in the Area, as well as to pasture and woodland. Internal drainage is not a limitation, nor is erosion. The surface can be scoured, however, during any severe flooding. Areas subject to severe or frequent flooding generally are used for pasture, for woodland, or wildlife. Capability unit I-6; woodland subclass 1o.

Cut and Fill Land

Cut and fill land (Cx) consists of areas where the soil has been cut away by grading or land leveling and of areas that have been filled with soil and other materials, commonly to a depth of many feet. In places the fill is only a foot or two in thickness. Included in mapping are a few areas where the fill is garbage or other solid waste. Also included are some paved areas, such as shopping plazas.

Cut and fill land is so variable that the suitability of any particular area for a given use must be determined by onsite investigation. It is not used for woodland, though some areas

are planted to trees. Most of the acreage is used for commercial or residential purposes. Capability unit and woodland subclass not assigned.

Delanco Series

The Delanco series consists of deep, moderately well drained, nearly level and gently sloping soils. These soils formed in old alluvial deposits of loamy micaceous sediment. They are on terraces bordering flood plains of major streams on the lower Piedmont and extending into the Coastal Plain. The native vegetation is mixed hardwoods that tolerate seasonal wetness.

In a representative profile the surface layer is brown or dark-brown silt loam, about 10 inches thick. The subsoil is about 24 inches thick and contains many mica flakes. It is yellowish-brown silty clay loam in the upper 19 inches and yellowish-red loam in the lower 5 inches. It is mottled with grayish colors below a depth of about 21 inches. The underlying material from a depth of 34 to 60 inches is friable, yellowish-brown fine sandy loam that is highly micaceous.

Delanco soils are fairly easy to work if the moisture content is favorable. They generally are wet in spring and slow to warm up, so planting can be delayed. They are moderately slowly permeable and have high available water capacity. Delanco soils have moderate to severe limitations for many nonfarm uses.

Representative profile of Delanco silt loam, 3 to 8 percent slopes, in a cultivated area on a terrace of Winters Creek, about 3 miles southwest of Abingdon:

Ap—0 to 7 inches, brown or dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; strongly acid; clear, wavy boundary.

A2—7 to 10 inches, brown (10YR 5/3) silt loam; weak, very thin, platy (plowsole), and weak, very fine, granular structure; friable to firm, slightly sticky; many roots; strongly acid; clear, smooth boundary.

B21t—10 to 21 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, medium, subangular blocky structure; firm, sticky and plastic; common roots; thin, discontinuous clay films; common mica flakes; very strongly acid; gradual, smooth boundary.

B22t—21 to 29 inches, yellowish-brown (10YR 5/6) silty clay loam; many, coarse, distinct mottles of grayish brown (10YR 5/2); moderate, medium, subangular blocky structure; firm, sticky and plastic; few roots; thin, continuous clay films; many mica flakes; very strongly acid; clear, smooth boundary.

B3—29 to 34 inches, yellowish-red (5YR 5/6) loam; few, fine, distinct mottles of grayish brown (10YR 5/2); weak, coarse, subangular blocky structure; friable, sticky and slightly plastic; many mica flakes; strongly acid; gradual, smooth boundary.

C—34 to 60 inches, yellowish-brown (10YR 5/6) fine sandy loam, streaked with yellowish red (5YR 5/6); massive; friable; highly micaceous; about 5 percent waterworn pebbles; very strongly acid.

The solum ranges from about 26 to 46 inches in thickness. The lower limit of the Bt horizon is within a depth of 40 inches. Depth to bedrock ranges from 5 feet to more than 20 feet. Bedrock at a depth of less than 10 feet generally is mica schist. Content of smooth waterworn pebbles ranges to as much as 5 percent in the solum and from about 5 to 25 percent in the C horizon. Content of mica is characteristic of the series, but it is variable in the solum. Unless the soil is limed, reaction is strongly acid to extremely acid.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 to 4. Only an A1 horizon less than 3 inches thick has the lowest value, and only the A2 horizon has the highest chroma.

The B horizon has a hue of 10YR or 7.5YR, or 5YR in a minor subhorizon; the value is 4 to 7 and the chroma is 6 or 8. The B22t horizon characteristically has mottles in chroma of 2 or less. The B horizon ranges from silty clay loam to loam.

The C horizon is variable in color, friable to firm, moderately to highly micaceous, and generally gravelly. In most places stratification is evident.

Delanco soils resemble Keyport, Mattapex, and Woodstown soils in color, morphology, and natural drainage. They contain less clay in the B horizon than Keyport soils and are not so sandy in the B horizon as Woodstown soils. They contain more sand and coarse fragments in the B horizon than Mattapex soils. They formed in the same general kind of old alluvium as the well-drained Elsinboro soils and the poorly drained Kinkora soils. They are micaceous, unlike the other soils in the survey area, and are shallower over bedrock.

Delanco silt loam, 0 to 3 percent slopes (DcA).—This soil has a profile similar to that described as representative of the series, but it generally is somewhat deeper over the fine sandy loam underlying material. Included in mapping are a few acres where the surface layer is somewhat more sandy than that described.

Erosion on this soil is little or no hazard. A water table is within a depth of about 2 feet in winter and early in spring. Artificial drainage is needed for early planted crops and is beneficial to other crops. Tile lines or ditches can be used for drainage. They should be fairly closely spaced because the soil is moderately slowly permeable. Corn and soybeans are principal crops, but pasture and other crops are also grown. Such perennial crops as alfalfa are subject to damage by frost heaving in winter and early in spring. If crop residue is not left on the surface, a winter crop is needed. Most undrained areas are used for pasture, woodland, and wildlife. Capability unit IIw-1; woodland subclass 2o.

Delanco silt loam, 3 to 8 percent slopes (DcB).—This soil has the profile described as representative of the series. Included in mapping are eroded areas, small areas where the surface layer is somewhat more sandy than that described, and a few acres where the slope is more than 8 percent.

Artificial drainage is needed in places, particularly for early planted crops. The moderate hazard of erosion generally is a more important limitation in farming than is impeded internal drainage.

This soil is suited to most crops generally grown in the area, and to pasture, woodland, and wildlife habitat. It is not well suited to perennial crops that are damaged by frost heaving in winter. Crop residue left on the surface or winter cover crop is needed to help control erosion. Capability unit IIe-16; woodland subclass 2o.

Elioak Series

The Elioak series consists of deep, well-drained, gently sloping and moderately sloping soils on the Piedmont Plateau. These soils are on broad ridgetops and adjacent upper slopes. They formed in materials deeply weathered in place from acid crystalline rocks, most commonly mica schist, or other rocks containing much mica. The native vegetation is mixed upland hardwoods, dominantly oaks, and in places Virginia pine.

In a representative profile the surface layer is dark grayish-brown silt loam about 8 inches thick. The subsoil, about 32 inches thick, is firm, yellowish-red and red silty clay loam and silty clay. The upper part is sticky when wet. The underlying material, from a depth of 40 inches to 65 inches, is variegated, very friable, highly micaceous disintegrated rock of fine sandy loam texture. Mica schist bedrock is at a depth of 65 inches.

Elioak soils are fairly easy to work if the moisture content is favorable. They are moderately permeable and have a high available water capacity. The chief limitations for

both farm and nonfarm uses are the slope and the accompanying moderate to severe hazard of erosion.

Representative profile of Elioak silt loam, 3 to 8 percent slopes, moderately eroded, in a cultivated area on State Highway 624, about 2 miles west of Whiteford:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; medium acid; abrupt, smooth boundary.

B1—8 to 15 inches, yellowish-red (5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable, sticky and slightly plastic; common roots; strongly acid; gradual, smooth boundary.

B21t—15 to 25 inches, red (2.5YR 4/6) silty clay; moderate, medium, subangular blocky structure; firm, sticky and plastic; few roots; prominent, reddish-brown (2.5YR 4/4) clay films; visible mica flakes; strongly acid; gradual, wavy boundary.

B22t—25 to 34 inches, red (2.5YR 4/8) heavy silty clay loam; weak, medium, blocky structure; firm, slightly sticky and slightly plastic; very few roots; discontinuous clay films; common mica flakes; very strongly acid; clear, smooth boundary.

B3—34 to 40 inches, red (2.5YR 4/8) silty clay loam; very weak, medium, platy structure; friable, slightly sticky; many mica flakes; strongly acid; gradual, wavy boundary.

C—40 to 65 inches, variegated red (2.5YR 4/8), pink (5YR 7/4), and reddish-yellow (5YR 6/6) fine sandy loam; rock-controlled laminar structure; very friable; highly micaceous; strongly acid; clear, irregular boundary.

R—65 inches, weathered, highly micaceous schist.

The solum ranges from about 30 to 50 inches in thickness, but generally averages less than 40 inches. Depth to bedrock ranges from about 5 to 10 feet. Content of angular pebbles of hard white quartzite ranges to as much as 15 percent. Pebbles generally are most abundant on or near the surface. Unless the soil is limed, reaction is medium acid to very strongly acid and acidity commonly increases with increasing depth.

The A horizon has a hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 to 4. Only an A1 horizon of an undisturbed profile has a value of 3.

The Bt horizon has a hue of 2.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. In places the value is 3 in thin subhorizons. This horizon ranges from silty clay loam or heavy clay loam to silty clay.

The C horizon is saprolite that most commonly is highly variegated in color but is of a single reddish color in places. It is highly micaceous and ranges from fine sandy loam to silt loam.

Elioak soils resemble Montalto soils in color, texture, and natural drainage. They generally have a thinner solum than Montalto soils, and are more micaceous throughout, especially in the C horizon. They are more strongly acid in the lower part of the solum and in the C horizon than Montalto soils and have lower base saturation. They formed in the same general kind of micaceous material as Chester, Glenelg, Glenville, and Manor soils, but are redder in color and have a higher clay content in the B horizon than those soils. They are better drained than Glenville soils.

Elioak silt loam, 3 to 8 percent slopes, moderately eroded (EhB2).—This soil has the profile described as representative of the series. In most areas it has lost a few inches of the original surface layer through erosion. Included in mapping are minor galled spots, areas where the surface layer contains a moderate amount of hard quartzite gravel, and a few acres where the slope is less than 3 percent.

This soil is suited to all farm uses and is limited only by the moderate hazard of further erosion. It can be protected from further erosion damage by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. In winter the surface should be protected by a cover crop or by crop residue left in place. Capability unit IIe-4; woodland subclass 2c.

Elioak silt loam, 8 to 15 percent slopes, moderately eroded. (EhC2).—In most areas this moderately sloping soil has lost about 3 to 6 inches of its original surface layer through erosion, and part of the subsoil is gullied. Included in mapping are areas where the surface layer contains a moderate amount of hard quartzite gravel.

The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Minimum tillage is needed and a cover crop or crop residue is needed to protect the surface between cropping seasons.

This soil is well suited to hay, pasture, and sodded orchards. It is a good woodland soil, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2c.

Elkton Series

The Elkton series consists of deep, poorly drained, nearly level soils on upland interfluvial flats of the Coastal Plain. These soils formed in old deposits of clayey marine sediment. The native vegetation is mainly willow oak, red maple, birch, and other hardwoods that tolerate wetness.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil, about 27 inches thick, is mainly gray, firm silty clay that has many prominent yellowish-brown and strong-brown mottles. It is very sticky and very plastic when wet. The underlying material from a depth of 34 inches to 60 inches is gray and greenish-gray light silty clay loam that is prominently mottled with strong brown.

Elkton soils have to be worked at the proper moisture content. They are firm and hard if too dry, and they do not support heavy machinery well if too wet. Plowing the soil when it is too wet forms clods that become hard upon drying. The water table is seasonally at or near the surface. The soil is slow to warm up in spring, so early planting generally is not practical. These soils are slowly permeable and the available water capacity is high. Drainage is slow and difficult. If these soils are artificially drained, they are suited to farming. Elkton soils have severe limitations for most nonfarm uses.

Representative profile of Elkton silt loam, in an idle area about one-half mile south of Swan Creek:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, fine, granular structure; friable, slightly sticky; many roots; medium acid; abrupt, smooth boundary.

B1g—7 to 10 inches, gray to light-gray (N 6/0) silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/4 and 5/6); weak, fine, subangular blocky structure; friable, sticky and plastic; many roots; strongly acid; gradual, smooth boundary.

B21tg—10 to 22 inches, gray (5Y 5/1) silty clay; common, medium, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) and a few, fine, faint mottles of greenish gray (5GY 5/1); moderate, medium, blocky structure; firm, very sticky and very plastic; few roots; very thin, discontinuous clay films; few fine black concretions; strongly acid; gradual, wavy boundary.

B22tg—22 to 34 inches, gray (N 5/0) silty clay; few, fine, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, blocky structure; firm, very sticky and very plastic; thin, discontinuous clay films; very strongly acid; gradual, wavy boundary.

Cg—34 to 60 inches, variegated gray (5Y 5/1) and greenish-gray (5GY 5/1) light silty clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/8); massive; firm, sticky and slightly plastic; very strongly acid.

The solum ranges from about 30 to 40 inches in thickness. Bedrock is at an undetermined great depth. Unless the soil is limed, reaction is strongly acid to extremely acid, and acidity commonly increases with increasing depth. The hue throughout the profile is 10YR to 5GY, or the color may be neutral.

The A horizon has a value of 3 to 6 and chroma of 0 to 3. Only the thin A1 horizon of an undisturbed profile has a value of 3. Only the A2 horizon, where present, has a value of 6.

The B horizon has a matrix value of 4 to 7 and matrix chroma of 0 to 2. Mottles are in hue 7.5YR or yellower, most commonly in chroma of 4 to 8, but low-chroma mottles occur in places. This horizon ranges from silty clay loam or heavy clay loam to clay or silty clay.

The C horizon has about the same color range as the B horizon, either single-colored or variegated matrices. The C horizon generally is silt loam, silty clay loam, or clay. In places a sandy IIC horizon is below a depth of 40 inches.

Elkton soils resemble Baile, Fallsington, Kinkora, Leonardtown, Othello, and Watchung soils in color and natural drainage. They have a more clayey B horizon than Baile, Fallsington, Leonardtown, and Othello soils. They are not micaceous, in contrast with Kinkora soils. They are much more strongly acid than Watchung soils. They are much deeper over bedrock than Baile, Kinkora, and Watchung soils. They formed in the same general kind of sediment as the moderately well drained Keyport soils.

Elkton silt loam (En).—This soil is nearly level. In places loamy material has accumulated in slight depressions. Included in mapping are small areas where the surface layer is a little more sandy than is typical and some areas where the slope is slightly more than 2 percent. This soil generally is free of coarse fragments but a few fine, smooth quartz pebbles occur at random in places. Some small areas have been filled or otherwise disturbed.

Poor natural drainage, slow permeability of the subsoil, and a water table that remains high for a large part of the year are limitations. Erosion is not a hazard.

Artificial drainage on this soil is difficult. Closely spaced drainage ditches and adequate outlets are needed. Tile drains do not function well. Grading the strips between ditches so that excess water runs into the ditches more readily is beneficial. Improved drainage makes possible annual crops that do not require early planting, mainly corn and soybeans. Capability unit IIIw-9; woodland subclass 3w.

Elsinboro Series

The Elsinboro series consists of deep, well-drained, nearly level to moderately sloping soils on terraces. These soils border flood plains of major streams on the lower Piedmont Plateau and extending onto the Coastal Plain. They formed in old alluvial deposits of loamy, micaceous sediment. The native vegetation is oaks and other upland hardwoods.

In a representative profile the surface layer, about 9 inches thick, is brown to dark-brown loam that is high in content of silt. The subsoil, about 23 inches thick, is strong-brown, friable light silty clay loam grading to loam in the lower part. It contains many mica flakes and commonly shows evidence of stratification. The underlying material from a depth of 32 inches to 60 inches is yellowish-red, friable, highly micaceous, stratified sandy loam that contains a few waterworn pebbles.

Elsinboro soils are easy to work if the moisture content is favorable. They are moderately permeable and have high available water capacity. They have few limitations, except for slope and the accompanying hazard of erosion.

Representative profile of Elsinboro loam, 2 to 5 percent slopes, moderately eroded, in an idle area about 1 mile east of Winters Creek and ½ mile south of U.S. Highway 40:

Ap—0 to 9 inches, brown to dark-brown (10YR 4/3) loam that is high in silt; weak, medium, granular structure; friable; many roots; common mica flakes; slightly acid; abrupt, smooth boundary.

B21t—9 to 15 inches, strong-brown (7.5YR 5/8) light silty clay loam; weak, fine and medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thin, discontinuous clay films; many mica flakes; slightly acid; gradual, smooth boundary.

B22t—15 to 26 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few roots; distinct, continuous clay films; many mica flakes; slightly acid; gradual, wavy boundary.

B23t—26 to 32 inches, strong-brown (7.5YR 5/6) loam; very weak, fine, subangular blocky structure; friable, slightly sticky; very thin, discontinuous clay films; highly micaceous; slightly acid; clear, smooth boundary.

IIC—32 to 60 inches, yellowish-red (5YR 5/6) sandy loam; friable; stratified; highly micaceous; few fine and medium waterworn pebbles; medium acid increasing to more strongly acid with increasing depth.

The solum ranges from about 28 to 40 inches in thickness. Depth to bedrock ranges from 6 feet to more than 20 feet. Bedrock at a depth of less than 10 feet most commonly is mica schist. Content of smooth waterworn pebbles, cobblestones, or both, commonly most abundant in the IIC horizon, ranges from about 2 to 20 percent. Pebbles generally are in thin strata in the solum. Mica is characteristic of the series and mica content commonly increases with increasing depth. Unless the soil is limed, reaction is strongly acid or very strongly acid.

The A horizon has a hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. Only the thin A1 horizon of an undisturbed profile has a value of 3.

The B horizon commonly becomes redder with increasing depth. The upper part is 10YR or 7.5YR, and the lower part is 7.5YR or 5YR. In the extreme lower part it is 2.5YR. The value is 4 or 5 and the chroma is 4 to 8. This horizon is loam, silt loam, clay loam, or light silty clay loam.

The C horizon generally is redder than the B horizon, and in all cases it is at least as red. It is sandy loam or sandy clay loam and is stratified.

Elsinboro soils resemble Chester, Glenelg, Matapeake, and Sassafras soils, but only Elsinboro soils are stratified. They are more micaceous than Chester, Matapeake, and Sassafras soils. They generally are deeper over bedrock than Chester and Glenelg soils, but they are much less deep over bedrock than Matapeake and Sassafras soils. Elsinboro soils formed in the same general kind of old alluvial sediment as the moderately well drained Delanco soils and the poorly drained Kinkora soils.

Elsinboro loam, 0 to 2 percent slopes (EsA).—This soil has a profile similar to that described as representative of the series, but it is generally deeper over the stratified underlying material. Included in mapping are small areas where the surface layer is more sandy than described, a few acres where the surface layer contains fine gravel, and accumulations of loamy soil material in slight depressions. Some small areas have been filled or otherwise disturbed.

The soil is suited to all crops commonly grown in the survey area. It has no serious limitations for farming. Good management includes the application of fertilizer, lime, and manure; minimum tillage; and the use of a cover crop or crop residue to protect the surface in winter. Capability unit I-4; woodland subclass 2o.

Elsinboro loam, 2 to 5 percent slopes, moderately eroded (EsB2).—This soil has the profile described as representative of the series. In most areas it has lost a part of the original surface layer through erosion. Included in mapping are a few severely eroded spots and some shallow gullies, small areas where the surface layer is more sandy than described, and a few acres where the surface layer contains some fine gravel. Some small areas have been filled, graded, or otherwise disturbed.

The soil can be protected from a moderate hazard of further erosion by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particu-

larly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. Between cropping seasons, the surface should be protected by a winter cover crop or by crop residues left in place. The soil is suited to all locally grown crops, as well as to pasture, woodland, and wildlife habitat. Capability unit IIe-4; woodland subclass 2o.

Elsinboro loam, 5 to 10 percent slopes, moderately eroded (EsC2).—In most areas this soil has lost 3 to 6 inches of the original surface layer through erosion, and scattered galled spots and shallow gullies have formed. Included in mapping are small areas where the surface layer is more sandy than described, a few acres where the surface layer contains fine gravel, areas that have impeded subsoil drainage, and a few acres where the slope is slightly more than 10 percent.

The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. If the slope is long enough, contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential. This soil is well suited to hay, pasture, orchards, and woodland. Capability unit IIIe-4; woodland subclass 2o.

Evesboro Series

The Evesboro series consists of deep, excessively drained, moderately sloping sandy soils of the Coastal Plain. These soils formed in thick upland deposits of sand and loamy sand. They show evidence of having been reworked by wind since deposition. The native vegetation is chiefly drought-resistant oaks and some Virginia pine.

In a representative profile the surface layer is loamy sand about 18 inches thick. It is dark grayish brown in the upper 5 inches and light yellowish brown in the lower 13 inches. The subsoil, about 14 inches thick, is yellowish-brown, loose loamy sand that has a few thin bands of brighter yellowish brown or of strong brown. The underlying material, which extends from a depth of 32 inches to at least 60 inches, is light yellowish-brown, loose loamy sand.

Evesboro soils are easy to work under all moisture conditions. They are rapidly permeable and have low to very low available water capacity. They are limited for most uses by looseness, droughtiness, and a very low capacity to retain plant nutrients.

Representative profile of Evesboro loamy sand, 5 to 15 percent slopes, in a wooded area on south side of U.S. Highway 40, about 100 yards north of Otter Point Creek:

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) loamy sand; single grained; loose; many roots; strongly acid; clear, smooth boundary.

A2—5 to 18 inches, light yellowish-brown (10YR 6/4) loamy sand; single grained; loose; many roots; few, fine, clean quartz pebbles; strongly acid; gradual, smooth boundary.

B—18 to 32 inches, yellowish-brown (10YR 5/4) loamy sand; a few 1-inch lamellae of yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) coated loamy sand; single grained; loose; common roots; few, fine, clean quartz pebbles; strongly acid; gradual, wavy boundary.

C—32 to 60 inches, light yellowish-brown (10YR 6/4) loamy sand; single grained; loose; few roots; strongly acid.

The solum ranges from about 24 to 48 inches in thickness and averages about 30 inches. Bedrock is at an undetermined great depth. Fine, smooth quartz pebbles occur at random in many places, but rarely make up more than 2 percent of the soil mass. Unless the soil is limed, reaction is strongly acid to extremely acid. Except for lamellae in the B horizon, the hue throughout the profile is 10YR.

The A horizon has a value of 2 to 6 and a chroma of 1 to 4. Only an A1 horizon less than 3 inches thick has values of 2 and 3 and chroma of 1.

The B horizon has a value of 5 or 6 and a chroma of 4 or 6. In places it is uniform in color, most commonly yellowish brown (10YR 5/4). In other places it has lamellae of moderately contrasting colors in hue of 7.5YR, as described in the representative profile. This horizon is loamy sand or sand. In places the soil mass is sand that has lamellae of loamy sand.

The C horizon has a value of 4 to 7 and a chroma of 3 to 6. It is sand or loamy sand no finer than that in the B horizon.

Evesboro soils do not resemble any other soils of the survey area. No other soils of the Harford County Area formed in the same kind of sandy sediment.

Evesboro loamy sand, 5 to 15 percent slopes (EvC).—This is the only sandy soil mapped in the Harford County Area. It is on upland ridges. Slopes are short, irregular, and dunelike. Included in mapping are some small areas where the slope is slightly more than 15 percent.

Blowing sand is a hazard unless the surface is adequately protected. The soil is better suited to wood crops and to wildlife habitat than to crops and pasture. Only small areas in fields of other soils are farmed. Locally this soil is used for small subsistence gardens. Most of the acreage is covered with hardwoods or Virginia pine. Capability unit VIIs-1; woodland subclass 3s.

Fallsington Series

The Fallsington series consists of deep, poorly drained, nearly level soils on upland interfluvial flats of the Coastal Plain. These soils dominantly are gray throughout. They formed in old sandy marine sediment that contains only moderate amounts of silt and clay. The native vegetation is wetland hardwoods, chiefly oaks, birch, and red maple, and some pond pines.

In a representative profile the surface layer is dark-gray loam about 9 inches thick. The subsoil, about 21 inches thick, is gray to light-gray heavy sandy loam grading to sandy clay loam in the lower part. It has prominent mottles of yellowish brown and yellowish red. The underlying material from a depth of 30 inches to 50 inches is gray to light-gray, stratified sandy loam and loamy sand prominently mottled with yellowish brown.

Unless wet, Fallsington soils are easy to work. The water table is seasonally at or near the surface, and the soil is slow to warm up in spring. These soils are moderately permeable, and where adequate outlets are available, are fairly easy to drain. Available water capacity is high. The seasonal high water table and poor natural drainage severely limit Fallsington soils for most nonfarm uses.

Representative profile of Fallsington loam, in a rewooded area about 2 miles south of Perryman:

Ap—0 to 9 inches, dark-gray (10YR 4/1) loam, grading to sandy loam; weak, medium, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

B21tg—9 to 15 inches, gray to light-gray (10YR 6/1) heavy sandy loam; common, coarse, prominent mottles of yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure; friable, slightly sticky; many roots; thin discontinuous clay films; strongly acid; gradual, smooth boundary.

B22tg—15 to 30 inches, gray to light-gray (10YR 6/1) sandy clay loam, variegated with greenish gray (5GY 6/1); many, coarse, prominent mottles of yellowish brown (10YR 5/6) and yellowish red (5YR 4/8); weak, coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; common

roots; thin discontinuous clay films; very strongly acid; clear, smooth boundary.

Cg—30 to 50 inches, gray to light-gray (N 6/0) stratified sandy loam and loamy sand; common, medium, prominent mottles of yellowish brown (10YR 5/6 and 5/8); massive to single grained; loose to friable; many, fine, rounded and subangular quartz pebbles; very strongly acid.

The solum ranges from about 24 to 38 inches in thickness. Bedrock is at an undetermined great depth. Fine, smooth quartz pebbles occur at random in many places, but are in significant quantities only in the C horizon. Unless the soil is limed, reaction is strongly acid to extremely acid and acidity generally increases with increasing depth. The hue throughout the profile ranges from 10YR to 5Y, or the soil colors are neutral.

The A horizon has a value of 2 to 5 and chroma of 1 to 3. Only the thin A1 horizon of an undisturbed profile has value of 2 or 3.

The B horizon has a matrix value of 4 to 6 and matrix chroma of 0 to 2. In places the matrix of the B horizon has somewhat greenish-gray colors. This horizon is prominently mottled with high chroma in hues of 10YR or 5YR. It is sandy clay loam, loam, or heavy sandy loam.

The C horizon has approximately the same range in color as the B horizon. It ranges from sandy loam to sand, and the horizon commonly is stratified with two or more of these textures.

Fallsington soils resemble Baile, Elkton, Kinkora, Leonardtown, Othello, and Watchung soils in color and natural drainage. They have a less clayey B horizon than Elkton, Kinkora, and Watchung soils. They lack the mica component of Baile and Kinkora soils and do not have the fragipan of Leonardtown soils. They contain much less silt than Othello soils. They formed in the same general kind of marine sediment as the well drained Sassafras soils and the moderately well drained Woodstown soils.

Fallsington loam (Fs).—This soil is nearly level. Erosion is not a hazard. Included in mapping are a few acres where the surface layer contains more sand and less silt than that in the representative profile. Also included are a very few acres where the slope is slightly more than 2 percent. Loamy material has accumulated in some slight depressions.

Major limitations are poor natural drainage and a water table that remains high most of the year. If adequate outlets are available, artificial drainage is not difficult. Tile drains function well in this soil. If adequately drained, this soil is well suited to commonly grown crops, particularly corn and soybeans. It is well suited to wood crops and wildlife habitat. Capability unit IIIw-7; woodland subclass 2w.

Glenelg Series

The Glenelg series consists of deep, well-drained, gently sloping to strongly sloping soils in large areas of rolling to hilly uplands of the Piedmont Plateau. These soils formed in materials deeply weathered in place from acid crystalline rocks, mostly mica schists, so they contain large amounts of mica. The native vegetation is mixed upland hardwoods, mainly oaks, and some Virginia pine.

In a representative profile the surface layer, about 7 inches thick, is dark yellowish-brown loam that is high in silt content. The subsoil is about 19 inches thick. It is brown to dark-brown, friable silt loam in the upper 7 inches and brown, firm heavy silt loam in the lower 12 inches. The subsoil contains mica flakes. The underlying material from a depth of 26 inches to 60 inches is yellowish-brown, friable disintegrated rock of loam texture that is highly micaceous.

Glenelg soils are easy to work if the moisture content is favorable. Some Glenelg soils, however, contain hard quartzite gravel that is abrasive to farm implements. Some are very stony. These soils are moderately permeable and have high available water capacity. Slope, the hazard of erosion, and in places stoniness are slight to severe limitations.

Representative profile of Glenelg loam, 8 to 15 percent slopes, moderately eroded, in a cultivated area north of Cherry Hill Road, about 1½ miles northeast of Cherry Hill:

Ap—0 to 7 inches, dark yellowish-brown (10YR 4/4) loam that is high in silt; moderate, fine, granular structure; friable; many roots; few mica flakes; medium acid; clear, wavy boundary.

B21t—7 to 14 inches, brown or dark-brown (7.5YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable, slightly sticky; common roots; thin, discontinuous clay films; common mica flakes; slightly acid; gradual, smooth boundary.

B22t—14 to 26 inches, brown (7.5YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; few roots; thin clay films; common mica flakes; slightly acid; gradual, wavy boundary.

C—26 to 60 inches, yellowish-brown (10YR 5/6) loam; rock-controlled structure; friable; highly micaceous; medium acid, becoming more strongly acid with increasing depth.

The solum ranges from about 18 to 30 inches in thickness. Depth to bedrock ranges from about 4 feet to more than 10 feet. Content of coarse fragments ranges to as much as 20 percent, from pebbles to stones in size. In cultivated areas fragments generally are concentrated on or near the surface. They generally are hard white quartzite, but include hard gneiss or schist. Unless the soil is limed, reaction is strongly acid or very strongly acid.

The A horizon has a hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 1 to 4. Only the thin A1 horizon of an undisturbed profile has the lowest value and chroma.

The B horizon has a hue commonly of 7.5YR, but of 10YR or 5YR in some subhorizons. The value is 4 or 5, and the chroma is 4 to 8. This horizon is silt loam to silty clay loam. A thin, discontinuous, weakly structured B3 horizon is in places.

The C horizon generally is 3 feet thick or more. In places where it is less than 3 feet thick, it generally contains many coarse fragments, chiefly mica schist. This horizon has a wide range in color, and in many places it is variegated. It is loam or sandy loam.

Glenelg soils resemble Chester, Elsinboro, Matapeake, and Sassafras soils. They are not stratified as are Elsinboro soils. They generally have a thinner solum than Chester soils and are more micaceous. They are less deep to bedrock and more micaceous than Matapeake and Sassafras soils. They formed in the same general kind of micaceous material as Elioak, Chester, Glenville, and Manor soils. They are less red and less clayey than Elioak soils, are better drained than Glenville soils, and contain more clay in the B horizon and have a thicker solum than Manor soils.

Glenelg loam, 3 to 8 percent slopes, moderately eroded (GcB2).—This soil has a profile similar to that described as representative of the series, but the subsoil generally is somewhat thicker. Included in mapping are a few severely eroded spots, gullies, and local accumulations of loamy soil material at the bases of slopes and in slight depressions. Some areas have been graded or otherwide disturbed.

The soil is well suited to farming as well as to other uses. It can be protected from a moderate hazard of further erosion by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. Between cropping seasons the surface should be protected by a winter cover crop or by crop residues left in place. Capability unit IIe-4; woodland subclass 2o.

Glenelg loam, 8 to 15 percent slopes, moderately eroded (GcC2).—This soil has the profile described as representative of the series. In most areas it has lost 3 to 8 inches of the original surface layer through erosion. Included in mapping are severely eroded spots, shallow gullies, and accumulations of loamy soil material at the bases of slopes. Some areas have been graded or otherwise disturbed.

The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded

waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2o.

Glenelg loam, 8 to 15 percent slopes, severely eroded (GcC3).—In most areas this soil has lost most or all of the original surface layer through erosion, so the plow layer consists largely of slightly sticky subsoil material. In many places the friable, highly micaceous underlying material is within a depth of 20 inches. Gullies are common, and in places they have penetrated through the subsoil into the underlying material.

The hazard of continued erosion is severe, and the soil generally is not suited to cultivated crops. Intensively applied and maintained soil-conserving measures are needed if the soil is to be tilled at all. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used. This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Capability unit IVe-3; woodland subclass 2o.

Glenelg loam, 15 to 25 percent slopes, moderately eroded (GcD2).—This soil has lost a large part of the original surface layer through erosion. Plowing to normal depth turns up part of the subsoil in places, and freshly worked areas thus appear spotted. Included in mapping are shallow gullies, areas where the subsoil is redder and more clayey than typical, and areas that have somewhat impeded subsoil drainage. Some areas have been graded or otherwise disturbed.

The hazard of continued erosion is very severe if the soil is tilled. Intensively applied and maintained soil-conserving measures are needed. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used. Even under the best management, this soil generally is unsuited to cultivated crops. It is better suited to hay, pasture, sodded orchards, or woodland. Capability unit IVe-3; woodland subclass 2r.

Glenelg loam, 15 to 25 percent slopes, severely eroded (GcD3).—In most places, the plow layer of this soil is subsoil material, and the highly micaceous underlying material is close to the surface. Gullies are common to abundant, and many of them have penetrated through the subsoil into the underlying material. Included in mapping are areas where the subsoil is redder and more clayey than is typical.

This soil is so severely eroded that it is very severely limited for farming. It is not suited to cultivated crops. It is suited to limited hay production and to limited grazing of carefully managed pasture. In some areas it is suited to sodded orchards. Many areas are suited to wood crops and are important in watershed protection. Capability unit VIe-2; woodland subclass 2r.

Glenelg gravelly loam, 3 to 8 percent slopes, moderately eroded (GgB2).—The profile of this soil is similar to that described as representative of the series, but the subsoil is a little thicker and, more important, this soil contains many small rock fragments. These fragments mostly are hard white quartzite, but include hard gneiss or schist, and are more abundant on or near the surface than in the subsoil. In most areas this soil has lost a part of the original surface layer through erosion. Included in mapping are galled spots and shallow gullies, areas where the slope is less than 3 percent, and accumulations of gravelly loamy soil material in slight depressions. Small areas have been graded or otherwise disturbed.

This soil is suited to farming and other uses. Major limitations to farm use are the moderate hazard of further erosion and the hard gravel fragments. These fragments are abrasive to farm implements and can hinder the preparation of a good seedbed. The soil can be protected from further erosion damage by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. Between growing seasons the surface should be protected by a winter cover crop or by crop residue left in place. Capability unit IIe-4; woodland subclass 2o.

Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded (GgC2).—The profile of this soil is similar to that described as representative of the series, but the soil contains many small rock fragments. The fragments dominantly are quartzite, but include hard gneiss or schist. Fragments that have been exposed by farming accumulate in furrows, rills, shallow gullies, and on the lower parts of slopes.

The rock fragments are abrasive to farm implements. The soil has a severe hazard of further erosion if it is tilled. Intensive soil-conserving measures are needed. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2o.

Glenelg gravelly loam, 8 to 15 percent slopes, severely eroded (GgC3).—In most areas this moderately sloping soil has lost most or all of the fine material of the original surface layer through erosion. The plow layer consists mostly of the somewhat sticky subsoil material and a large amount of quartzite or other hard gravel. In many places the friable, highly micaceous underlying material is within a depth of 20 inches. Gullies are common and in many areas have penetrated through the subsoil into the underlying material.

Rock fragments that have been exposed by fieldwork almost carpet the soil surface, particularly in gullies and at the bases of slopes. These fragments are abrasive to farm implements and machinery. The hazard of further erosion is severe if the soil is tilled, and continued erosion produces more gravel.

This soil generally is not suited to cultivated crops. If it is tilled, intensive soil-conserving measures are needed. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used. This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Capability unit IVe-3; woodland subclass 2o.

Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded (GgD2).—This soil has lost a moderate amount of the fine material of the original surface layer through erosion. Plowing to normal depth turns up part of the

subsoil material in places, and freshly worked areas appear spotted. The soil, particularly the plow layer, contains moderate quantities of hard white quartzite or other hard angular gravel. These rock fragments accumulate in shallow gullies and on the lower parts of slopes and are exposed almost everywhere on the soil surface. Included in mapping are spots where the subsoil is redder and more clayey than is typical.

The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used. Even under the best management, this soil generally is not suited to cultivated crops. It is better suited to hay, pasture, sodded orchards, or woodland. Capability unit IVe-3; woodland subclass 2r.

Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded (GgD3).—The plow layer of this soil is a mixture of subsoil material and gravel, and the highly micaceous underlying material is near the surface. Gullies are common to abundant, and many of them have penetrated through the subsoil into the underlying material. Gravel fragments almost cover the soil surface in places and are particularly abundant in gullies and at the bases of slopes. Included in mapping are areas where the subsoil is redder and more clayey than is typical and areas where some of the rock fragments are hard black slate.

This soil is so severely eroded that it is severely limited for farming. It is not suited to cultivated crops. It is suited to limited hay production and to limited grazing of carefully managed pasture. Some areas can be used for sodded orchards. Many areas are suited to wood crop production and watershed protection. Capability unit VIe-2; woodland subclass 2r.

Glenville Series

The Glenville series consists of moderately well drained to somewhat poorly drained, nearly level to gently sloping soils on the uplands of the Piedmont Plateau. These soils are only moderately deep over a fragipan. They formed mostly in material weathered in place from underlying micaceous rocks; in places the upper part of the profile formed in local alluvium. The native vegetation is water-tolerant hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil extends to a depth of 44 inches. The upper 8 inches is yellowish-brown, friable heavy silt loam. Below this to a depth of about 28 inches is a firm and brittle fragipan; it is yellowish-brown heavy silt loam to light silty clay loam mottled with grayish and brownish colors. Below the pan is 16 inches of yellowish-brown, friable silt loam. The underlying material to a depth of 60 inches is variously colored, very micaceous, disintegrated rock of loam texture.

Glenville soils are fairly easy to work if the moisture content is favorable, but they are wet in spring and slow to warm up. Planting frequently is delayed. These soils are moderately slowly permeable, and in wet seasons they have a perched water table above the fragipan. Available water capacity is moderate. In dry seasons, Glenville soils dry out more quickly and thoroughly than soils that have a more permeable subsoil. These soils have moderate to severe limitations for many nonfarm uses.

Representative profile of Glenville silt loam, 3 to 8 percent slopes, in a pasture on Grafton Shop Road, 2 miles east of High Point:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable, slightly sticky and slightly plastic; many roots; medium acid; abrupt, smooth boundary.

B2t—7 to 15 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; many roots; faint clay films; medium acid; clear, smooth boundary.

Bx1—15 to 20 inches, yellowish-brown (10YR 5/6) heavy silt loam; many, fine, distinct mottles of light brownish gray (10YR 6/2); weak, thin, platy and weak, fine, subangular blocky structure; firm, brittle, slightly sticky; very few roots; faint clay films; common mica flakes; strongly acid; gradual, wavy boundary.

Bx2—20 to 28 inches, yellowish-brown (10YR 5/6) light silty clay loam, few, fine, faint mottles of pale brown (10YR 6/3) and strong brown (7.5YR 5/6); moderate, medium, platy and subangular blocky structure; firm, brittle, slightly sticky; faint clay films; many mica flakes; strongly acid; gradual, smooth boundary.

B3—28 to 44 inches, yellowish-brown (10YR 5/6) silt loam; many, medium and coarse, distinct mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8); very weak, medium, subangular blocky structure; friable, slightly sticky; many mica flakes; very strongly acid; clear, irregular boundary.

C—44 to 60 inches, highly variegated loam; rock-controlled structure; firm; highly micaceous; strongly acid.

The solum ranges from about 30 to 48 inches in thickness, but the fragipan terminates within a depth of 40 inches. Depth to bedrock is 4 to more than 6 feet. Depth to the fragipan is 15 to 30 inches. Content of coarse fragments of schist or quartzite ranges to as much as 15 percent in the solum, and to somewhat more in the C horizon. Unless the soil is limed, reaction is medium acid to very strongly acid.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. Only a thin A1 horizon of an undisturbed profile has a value of 3.

The B horizon has a hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. The upper part of the fragipan characteristically is mottled with chromas of 2 or less, and high-chroma mottles occur throughout the fragipan in many places. This horizon is loam, silt loam, clay loam, or light silty clay loam.

The C horizon has a wide range in color, and in many places it is variegated. It is fine sandy loam, loam, or light silt loam.

Glenville soils are similar to Aldino and Beltsville soils, but in contrast they generally are not so well aerated, are seasonally wet, and have a much higher content of mica. They formed in the same general kind of underlying material as the well-drained Chester, Elioak, and Glenelg soils and the well-drained to somewhat excessively drained Manor soils.

Glenville silt loam, 0 to 3 percent slopes (GnA).—The profile of this soil is similar to that described as representative of the series, but in most places the surface layer and subsoil are somewhat thicker.

The hazard of erosion is only slight. This soil quickly becomes saturated above the fragipan during heavy rains or snowmelt. It generally remains wet for a fairly long period because runoff is slow and permeability of the fragipan is moderately slow.

Artificial drainage is needed for full production of some crops and benefits other crops and other uses. Either tile drains or ditches function fairly well. Drains generally are placed just below the upper surface of the fragipan. If drainage is improved, the soil is suited to most commonly grown crops except early planted ones. Such perennial crops as alfalfa are subject to severe damage by frost heaving in winter and early in spring. Many areas of this soil are in pasture (fig. 7), and some are in woodland. Capability unit IIw-1; woodland subclass 2w.

Glenville silt loam, 3 to 8 percent slopes (GnB).—This soil has the profile described as representative of the

Figure 7.—**Farm pond in area of Glenville silt loam. Glenelg and Manor soils are in the background and foreground.**

series. Included in mapping are scattered shallow gullies, areas where silty soil material has accumulated in slight depressions, and a few acres where the slope is more than 8 percent.

The hazard of erosion is moderate. In most places the erosion hazard is a more serious limitation than poor drainage. A suitable crop rotation, particularly in strips, is effective in conserving soil. Cover crops or crop residue to protect the surface between growing seasons is essential.

The soil is suited to all commonly grown crops except early planted ones. Such perennial crops as alfalfa are damaged by frost heaving in winter and early in spring. Ditches or tile lines are needed for drainage in some cultivated areas. More important in most areas is the collection and disposal of seasonally excess surface water. Interceptors or diversions and grassed waterways are commonly used. If row crops are grown, graded rows improve surface drainage and erosion control. Capability unit IIe-16; woodland subclass 2w.

Hatboro Series

The Hatboro series consists of deep, poorly drained, nearly level soils on flood plains, mainly on the Piedmont Plateau. Areas of these soils extend along the banks of major streams onto the Coastal Plain. These soils formed in dominantly loamy recent alluvium that originally washed from areas of soils that formed chiefly from crystalline rocks. The native vegetation is mixed wetland hardwoods.

In a representative profile the surface layer is silt loam about 10 inches thick. The upper 7 inches is dark brown and has many reddish-brown mottles. The lower 3 inches is brown and has a few faint mottles of yellowish brown. The subsoil is about 31 inches thick. It is gray, friable silt loam mottled with yellowish brown in the upper 16 inches and firm, grayish-brown silt loam mottled with yellowish brown and strong brown in the lower 15 inches. The subsoil contains common to many mica flakes. The underlying material from a depth of 41 inches to 60 inches is stratified, micaceous sandy clay loam and silt loam, variegated in color and commonly mottled with gray.

Hatboro soils are fairly easy to work if the moisture content is favorable, but they are wet in spring and slow to warm up. The water table is at or near the surface for long periods in winter and spring. These soils are subject to flooding. Plowing and planting thus generally are delayed. These soils are moderately permeable and are fairly easy to drain if adequate outlets are available. They have high available water capacity. If adequately drained and adequately protected from flooding, these soils are suited to

most farm uses. They have severe limitations for most nonfarm uses.

Representative profile of Hatboro silt loam, in a pasture on the flood plain of Broad Creek, about one-half mile northeast of Mill Green:

A11—0 to 7 inches, dark-brown (10YR 3/3) silt loam; common fine, distinct mottles of reddish brown (5YR 4/4); moderate, fine, granular structure; friable, slightly sticky; many roots; slightly acid; gradual, wavy boundary.

A12—7 to 10 inches, brown (10YR 5/3) silt loam; few, medium, faint mottles of yellowish brown (10YR 5/4); weak, fine, granular structure; friable, slightly sticky; many roots; medium acid; clear, smooth boundary.

B21g—10 to 26 inches, gray (10YR 5/1) silt loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/6); weak, fine and medium, subangular blocky structure; friable, slightly sticky; common roots; common mica flakes; strongly acid; clear, wavy boundary.

B22g—26 to 41 inches, grayish-brown (10YR 5/2) heavy silt loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6); weak, medium and fine, subangular blocky structure; firm, sticky and slightly plastic; few roots; many mica flakes; medium acid; clear, smooth boundary.

IIC—41 to 60 inches, variegated light olive-brown (2.5Y 5/4) and yellowish-brown (10YR 5/6), stratified sandy clay loam, sandy loam, and silt loam; common, medium, distinct mottles of gray (10YR 5/1); friable; micaceous; medium acid.

The solum ranges from about 40 to 60 inches in thickness. Depth to bedrock ranges from 4 to more than 10 feet. Bedrock at a depth of less than 10 feet most commonly is mica schist. Smooth water-worn pebbles are in places, but are not abundant except in the IIC horizon. Mica is characteristic of the series, but the content in the solum is variable. Reaction generally is medium acid to neutral, but horizons at a depth of less than 30 inches are more strongly acid in places.

The A horizon commonly has a hue of 10YR, value of 3 to 5, and chroma of 2 to 4. Mottles are common in places.

The B horizon has a matrix hue of 10YR to 5Y, matrix value of 5 to 7, and matrix chroma of 1 or 2. This horizon has high-chroma mottles in hue 10YR, 7.5YR, or rarely 5YR. It is silt loam to light silty clay loam.

The C horizon has a wide range in color. In places the colors are variegated, and there are colors with chroma of 2 or less throughout. This horizon is stratified, and is dominantly more sandy or more gravelly, or both, than the solum.

Hatboro soils do not closely resemble any other soils mapped in the Harford County Area. On the upper parts of flood plains in some areas, they are associated with poorly drained Baile soils of the uplands. They are more readily permeable than Baile soils, which are not generally subject to flooding. They formed in the same kind of sediment, on flood plains, as the well-drained Comus soils and the moderately well drained to somewhat poorly drained Codorus soils.

Hatboro silt loam (Hb).—This soil is nearly level. It is on many small flood plains and on the lower and wetter parts of larger flood plains. Included in mapping are a few acres where the slope is more than 3 percent.

The hazard of flooding can be predicted only by knowing the history of the particular flood plain. Where drainage is improved and the hazard of flooding is no more than moderate, the soil is suited to farming. Common crops are corn and improved pasture. If adequate outlets are available, either tile lines or ditches are effective for drainage. Areas that are subject to severe or frequent flooding generally are not drained or cleared. Cleared areas are used for seasonal pasture. Uncleared areas support good stands of hardwoods. Capability unit IIIw-7; woodland subclass 3w.

Joppa Series

The Joppa series consists of deep, well-drained to excessively drained, gently sloping to steep gravelly soils on the Coastal Plain. These soils formed in thick deposits of sandy and gravelly sediment that contains small amounts of silt and clay. They generally are in hilly areas in higher parts of the Coastal Plain, close to its juncture with the Piedmont Plateau. The native vegetation is drought-resistant hardwoods, mostly oaks, and some Virginia pine.

In a representative profile the surface layer is gravelly sandy loam about 9 inches thick. It is very dark gray in the upper 3 inches and yellowish brown in the lower 6 inches. The subsoil, about 20 inches thick, is yellowish-brown and strong-brown, friable gravelly sandy loam. The lower part is 50 percent rounded pebbles less than 2 inches in diameter. The underlying material from a depth of 29 inches to 72 inches is very gravelly sand, variegated with brownish colors. This material is about 60 percent rounded pebbles.

Joppa soils are easy to work, but the pebbles are abrasive to farm implements. These soils are moderately rapidly permeable to rapidly permeable, and they have low available water capacity. Limitations are droughtiness, low capacity to retain plant nutrients, high gravel content, and in most areas slope.

Representative profile of Joppa gravelly sandy loam, 2 to 5 percent slopes, in a wooded area northeast of Abingdon:

A1—0 to 3 inches, very dark gray (10YR 3/1) gravelly sandy loam; weak, fine, granular structure; very friable; many roots; very strongly acid; clear, wavy boundary.

A2—3 to 9 inches, yellowish-brown (10YR 5/4) gravelly sandy loam; weak, fine, granular structure; very friable; many roots; very strongly acid; gradual, wavy boundary.

B1—9 to 16 inches, yellowish-brown (10YR 5/6) gravelly sandy loam; weak, medium, subangular blocky structure; friable, very slightly sticky; many roots; very strongly acid; clear, wavy boundary.

B2t—16 to 29 inches, strong-brown (7.5YR 5/6) gravelly heavy sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; common roots; about 50 percent rounded, well-graded pebbles as much as 2 inches in diameter; clay bridging between sand grains; yellowish-red (5YR 4/6) clay films on pebbles and some aggregates; very strongly acid; clear, wavy boundary.

C—29 to 72 inches, variegated yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) very gravelly sand; very thin horizontal bands of reddish brown (5YR 4/4) 2 to 5 inches apart; single grained; loose to very friable; few roots; about 60 percent rounded, well-graded pebbles as much as 2 inches in diameter; very strongly acid.

The solum ranges from about 20 to 40 inches in thickness. Bedrock is at an undetermined great depth. Gravel content is more than 15 percent in the A and B1 horizons, more than 35 percent in the Bt horizon, and more than 50 percent in the C horizon. Unless the soil is limed, reaction is strongly acid to extremely acid.

The A horizon has a hue of 10YR or 7.5YR, value of 2 to 5, and chroma of 1 to 4. Only an A1 horizon less than 4 inches thick in an undisturbed profile has a value of 2 or 3. Only the A2 horizon has a chroma of 4.

The B horizon generally has a hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. In places the B1 horizon has a hue of 10YR, and in most places the Bt horizon is redder than the B1 horizon. The B horizon is gravelly sandy loam to gravelly light loam.

The C horizon has a hue of 10YR to 5YR, and colors generally are variegated. The fine material in this horizon is sand, loamy sand, or light sandy loam.

Joppa soils do not closely resemble any other soils mapped in the Harford County Area. They contain much more gravel and are more droughty than the associated Sassafras soils. They are the only soils in the survey area that formed directly in highly gravelly deposits. Similar deposits, however, underlie Beltsville, Chillum, and other soils of the Coastal Plain.

Joppa gravelly sandy loam, 2 to 5 percent slopes (JpB).—This soil has the profile described as representative

of the series. If it is cultivated, however, the plow layer is grayish brown or dark grayish brown. Included in mapping are a few acres where the slope is less than 2 percent, some eroded areas, and areas where the subsoil is red instead of brown.

The low available water capacity of this soil has more effect on its use and management in farming than the slight hazard of erosion. The soil is better suited to truck crops or early planted crops than to other crops. Content of abrasive gravel makes the preparation of a good seedbed difficult. Supplemental irrigation, overhead or sprinkler type, is beneficial and generally is needed during dry seasons for full crop production. Good management includes fertilizer in larger than usual amounts, use of cover crops, animal and green manures, and crop residue. Capability unit IIs-4; woodland subclass 3f.

Joppa gravelly sandy loam, 5 to 10 percent slopes (JpC).—Included with this soil in mapping are moderately eroded and severely eroded areas and small areas where the subsoil is red instead of brown. Also included are a few acres where the subsoil is hard and compact and the surface layer is somewhat more silty and less gravelly than is typical.

Even though this soil is less erodible than most other soils that have similar slopes, the hazard of erosion is moderate. Available water capacity is low.

The soil is suited to crops, particularly early truck crops, but supplemental irrigation is needed during dry seasons. Farming on the contour, particularly in strips, is effective in conserving soil and water. Good management includes use of fertilizer in larger than usual amounts, cover crops, animal and green manures, and crop residue. Capability unit IIIe-33; woodland subclass 3f.

Kelly Series

The Kelly series consists of deep, somewhat poorly drained, gently sloping to strongly sloping soils that have a heavy clay subsoil. These soils are on moderately rolling uplands of the Piedmont Plateau. They formed in material weathered in place from dark-colored basic rocks, chiefly diabase and gabbro. The native vegetation is oaks, other hardwoods, and Virginia pine.

In a representative profile the surface layer is silt loam about 6 inches thick. It is very dark grayish brown in the upper 2 inches and light olive brown in the lower 4 inches. The subsoil extends to a depth of 40 inches. The upper 5 inches is light yellowish-brown, firm silty clay loam that is sticky when wet. The next 23 inches is light olive-brown and grayish-brown, firm clay that is mottled with gray and yellowish brown. It is sticky to very sticky and very plastic when wet. The lower 6 inches is yellowish-brown, firm silty clay that is mottled with gray. It is very sticky and very plastic when wet. The underlying material from a depth of 40 inches to 54 inches is firm clay loam of highly variegated colors. Gabbro is at a depth of about 54 inches.

Kelly soils are difficult to work, even if the moisture content is favorable, because plowing to normal depth turns up the heavy, sticky subsoil. They seldom are cultivated. The water table is seasonally near the surface, and the subsoil is so slowly permeable that even if artificially drained, a long period is required for the soil to dry. Available water capacity is moderate to high. These soils generally are used for hay crops and pasture. They have severe limitations for most nonfarm uses. Many areas are very stony.

Representative profile of Kelly silt loam, 3 to 8 percent slopes, in a wooded area on Thomas Run Road, about 0.3 mile north of Prospect Mill Road:

A1—0 to 2 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; medium acid; clear, wavy boundary.

A2—2 to 6 inches, light olive-brown (2.5Y 5/4) silt loam; moderate, fine, granular structure; friable, slightly sticky and slightly plastic; many roots; medium acid; gradual, wavy boundary.

B1—6 to 11 inches, light yellowish-brown (2.5Y 6/4) silty clay loam; weak, thin, platy and weak, fine, subangular blocky structure; firm, sticky and plastic; common roots; strongly acid; gradual, wavy boundary.

B21t—11 to 27 inches, light olive-brown (2.5Y 5/4) clay; common, fine, faint mottles of gray (5Y 5/1) and common, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, blocky structure; firm, sticky and very plastic; few roots; distinct olive (5Y 5/3) clay films; slightly acid; gradual, irregular boundary.

B22tg—27 to 34 inches, grayish-brown (2.5Y 5/2) clay; common, fine and medium, faint mottles of gray (N 5/0) and common, medium, distinct mottles of yellowish brown (10YR 5/4); moderate, coarse, prismatic and blocky structure; firm, very sticky and very plastic; distinct olive (5Y 5/3) clay films; many fine scattered black films and weak concretions; slightly acid; gradual, irregular boundary.

B3—34 to 40 inches, yellowish-brown (10YR 5/4) silty clay; many, fine, distinct mottles of gray (5Y 5/1); very weak, coarse, blocky structure; firm, very sticky and very plastic; many weak, fine, black concretions; neutral; gradual, irregular boundary.

C—40 to 54 inches, highly variegated clay loam; rock-controlled structure; firm, sticky and slightly plastic; neutral; abrupt, irregular boundary.

R—54 inches, hard, weathered gabbro.

The solum ranges from about 26 to 40 inches in thickness. Depth to bedrock ranges from 3½ to 5 feet. In places abundant stones of gabbro or diabase are on and near the surface. Black mineral concretions are in the lower part of most profiles. Reaction is strongly acid to neutral, and acidity decreases with increasing depth.

The A horizon has a hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. Only the thin A1 horizon of an undisturbed profile has a value of 3. The A horizon is only 4 to 8 inches thick in an uneroded soil.

The B horizon has a matrix hue of 2.5Y to 7.5YR, matrix value of 4 to 6, and matrix chroma of 2 to 4. Only the B1 horizon has a value of 6. Only a subhorizon in the lower part of some profiles has a chroma of 2. The B horizon is mottled throughout in chroma of 2 or less, except for the B1 horizon, which is no more than 6 inches thick. The B horizon, in many places, has high-chroma mottling. This horizon ranges from silty clay loam to clay and is most commonly clay or silty clay.

The C horizon is variegated or streaked, mostly with chromas less than 3, and has many mottles of neutral gray. It ranges from silt loam or clay loam to clay.

Kelly soils do not resemble any other soils mapped in the Harford County Area. They formed in the same general kind of residuum as the well-drained Legore and Montalto soils and the poorly drained Watchung soils.

Kelly silt loam, 3 to 8 percent slopes (KeB).—This soil has the profile described as representative of the series. If it is cultivated, however, the plow layer generally is more sticky and less friable than that in an undisturbed area. Included in mapping are small areas that are more nearly level and some eroded areas. Also included are areas where the surface layer contains a moderate amount of gravel, and small areas where the subsoil contains less clay than is typical. Some areas have been filled, graded, or otherwise disturbed.

This soil is suited to pasture and trees and in places to cultivated crops that tolerate soil wetness. The crop most commonly grown is corn. Wetness is the chief limitation. The soil is difficult to drain and is difficult to work even if

drained. Ditches generally are used for drainage, because tile lines do not function properly in the slowly permeable clay subsoil. Erosion is a hazard. Cover crops and crop residue are needed, as much of the time as practical, to protect the soil surface. Capability unit IVw-3; woodland subclass 4w.

Kelly silt loam, 8 to 15 percent slopes, moderately eroded (KeC2).—This soil has a profile similar to that described as representative of the series but the silt loam surface layer is thinner in most places. Included in mapping are severely eroded areas where the clay subsoil is exposed, places where the surface layer contains a moderate amount of gravel, and small areas where the subsoil contains less clay than is typical. Small areas have been graded or otherwise disturbed.

The tough clay subsoil makes this soil very difficult to work. Wetness and the subsoil are the main limitations, although the hazard of erosion is severe if the soil is tilled. Cover crops and crop residue are needed, as much of the time as practical, to protect the soil surface. The soil is better suited to pasture or woodland than to cultivated crops. It is, however, suited to cultivated crops such as corn, that tolerate wetness. Capability unit IVw-3; woodland subclass 4w.

Kelly very stony silt loam, 3 to 25 percent slopes (KfD).—This soil is so wet, so heavy, so stony, and so strongly sloping that it is not used in farming. Nearly all areas are under woodland cover and are better suited to wood crops and wildlife habitat. Capability unit VIIs-4; woodland subclass 4w.

Keyport Series

The Keyport series consists of deep, moderately well drained, nearly level and gently sloping soils on uplands, chiefly in the geologically older parts of the Coastal Plain. These soils formed in old marine sediment that is high in content of clay and moderately high in content of silt. The native vegetation is mixed hardwoods that tolerate seasonal wetness.

In a representative profile the surface layer is brown or dark-brown silt loam about 7 inches thick. The upper 10 inches of the subsoil is yellowish-brown, slightly firm silty clay loam. It is slightly sticky when wet. The lower 25 inches is yellowish-brown, firm heavy silty clay loam that is mottled with gray and greenish gray and is sticky to very sticky when wet. The underlying material from a depth of 42 inches to 55 inches is yellowish-brown, firm silty clay loam that is mottled and streaked with grayish and brownish colors.

Keyport soils are fairly easy to work if the moisture content is favorable, but they generally are wet in spring and fairly slow to warm up. Plowing to normal depth can turn up the sticky subsoil. The slowly permeable subsoil makes drainage improvement difficult and slow. The available water capacity is high. Keyport soils are fairly well suited to farming, but they have moderate to severe limitations for most nonfarm uses.

Representative profile of Keyport silt loam, 0 to 2 percent slopes, in an idle area about 2 miles east of Aberdeen:

Ap—0 to 7 inches, brown or dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; medium acid; abrupt, smooth boundary.

B21t—7 to 17 inches, variegated yellowish-brown (10YR 5/4 to 10YR 5/8) silty clay loam; weak, fine and medium, subangular blocky structure; slightly firm, slightly sticky and slightly plastic; many roots; thin, continuous clay films; very strongly acid; gradual, smooth boundary.

B22t—17 to 32 inches, variegated yellowish-brown (10YR 5/4 to 10YR 5/8) heavy silty clay loam; common, medium, distinct mottles of greenish gray (5GY 5/1) in the lower part; moderate, fine, prismatic and medium subangular blocky structure; firm, sticky and plastic; common roots; thick, continuous clay films; extremely acid; gradual, smooth boundary.

B23t—32 to 42 inches, variegated yellowish-brown (10YR 5/6 and 10YR 5/8) heavy silty clay loam; many, coarse, prominent mottles of gray (N 5/0); moderate, medium, prismatic and medium to coarse, subangular blocky structure; firm, plastic and very sticky; few roots; thin, continuous clay films; extremely acid; gradual, wavy boundary.

C—42 to 55 inches, yellowish-brown (10YR 5/6) silty clay loam, streaked with gray or light gray (N 6/0); few, fine, faint mottles of light olive brown (2.5Y 5/4); massive; a few widely spaced vertical cleavages; firm, sticky and plastic; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at an undetermined great depth. Coarse fragments generally are not present throughout the profile. Unless the soil is limed, reaction is very strongly acid or extremely acid.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. Only the thin A1 horizon of an undisturbed profile has a value of 3.

The B horizon has a matrix hue of 2.5Y to 7.5YR, matrix value of 4 to 6, and matrix chroma of 3 to 6, or to 8 in places where the matrix color is variegated. Mottles in chroma of 2 or less are in the lower part of this horizon, but generally do not occur in the upper 10 inches. The B horizon ranges from silty clay loam through silty clay to clay.

The C horizon has a neutral matrix color or a hue of 10YR to 5Y, value of 4 to 7, and chroma of 0 to 8. If the matrix chroma is 2 or less, there is high-chroma mottling. If the matrix chroma is 3 or more, there are streaks or mottles that have chroma of 2 or less. This horizon ranges from silt loam to clay. In places the C horizon contains very thin sandy strata, or thin sheets of iron-cemented sandy materials, or both.

Keyport soils resemble Delanco, Mattapex, and Woodstown soils in color and natural drainage, but they have a more clayey, more slowly permeable subsoil. They formed in the same general kinds of sediment as the poorly drained Elkton soils.

Keyport silt loam, 0 to 2 percent slopes (KpA).—This soil has the profile described as representative of the series. Included in mapping are many small areas that could not be mapped separately where a few gray or greenish-gray mottles are in the upper part of the subsoil. Also included are a few small areas where the surface layer is a little more sandy than is typical and areas of small accumulations of silty soil materials.

In this soil the seasonal high water table is within a depth of about 2 feet. Unless the water table is lowered artificially, it remains high until late in spring. Artificial drainage is needed for early planted crops and is beneficial to others. Tile drains generally do not function well in this soil. Properly spaced ditches generally are more satisfactory for drainage.

Corn and soybeans are the main crops, but pasture plants and other crops are also grown. Such perennial crops as alfalfa are subject to frost heaving in winter and early in spring. Although the hazard of erosion is slight, a winter cover crop is needed if crop residue is not left on the surface during winter. Undrained areas are suited to pasture, woodland, and wildlife habitat. Capability unit IIw-8; woodland subclass 3w.

Keyport silt loam, 2 to 5 percent slopes (KpB).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is somewhat thinner. Included in mapping are a few small areas where the surface layer is a little more sandy than is typical, scattered

acres where the soil is moderately eroded, and a few shallow gullies. Also included are a few acres where the slope is more than 5 percent.

Because this soil is sloping, runoff is rapid and little water enters the soil. Artificial drainage is only needed for crops in certain areas. The moderate hazard of erosion generally is more important in farming than the impeded internal drainage.

The soil is suited to corn, soybeans, pasture, and certain other crops. It is well suited to woodland and to wildlife habitat. Such perennial crops as alfalfa are subject to frost heaving in winter and early in spring. Using a cover crop and leaving crop residue to protect the soil surface between growing seasons is essential. Capability unit IIe-13; woodland subclass 3w.

Kinkora Series

The Kinkora series consists of deep, poorly drained, nearly level to gently sloping soils on terraces bordering flood plains of major streams. These soils are mostly on the Piedmont Plateau, but they extend onto the Coastal Plain. They formed in old alluvial deposits of micaceous sediment. The native vegetation is wetland hardwoods; cleared idle areas commonly support sedges, grasses, and herbs.

In a representative profile the surface layer is silt loam about 12 inches thick. It is dark grayish brown in the upper 9 inches and grayish brown in the lower 3 inches. The subsoil, about 19 inches thick, is gray to light-gray, firm heavy silty clay loam that has many prominent brown mottles. It is sticky to very sticky and plastic to very plastic when wet. The underlying material to a depth of about 37 inches is gray, firm silt loam. Below this to a depth of 50 inches it is gray to light-gray, stratified, micaceous, friable loam and fine sandy loam.

Kinkora soils generally are difficult to work because they are sticky when wet and hard and cloddy if too dry. They rarely are cultivated. The water table is seasonally at or near the surface. These soils are slow to warm up in spring. They are slowly permeable. If artificially drained by a system of ditches, they are suited to improved pasture. Drainage is slow and generally is difficult. The available water capacity is high. Kinkora soils are severely limited for most nonfarm uses.

Representative profile of Kinkora silt loam, 0 to 3 percent slopes, in a pasture on a terrace of Winters Creek, 200 yards east of State Highway 7:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; slightly acid; clear, smooth boundary.

A2g—9 to 12 inches, grayish-brown (10YR 5/2) heavy silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, fine, subangular blocky structure; firm, slightly sticky and slightly plastic; many roots; many fine, black, soft concretions; strongly acid; gradual, smooth boundary.

B21tg—12 to 20 inches, gray (10YR 5/1) heavy silty clay loam; common, medium, prominent mottles of yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm, sticky and plastic; common roots; very thin clay films; strongly acid; gradual, smooth boundary.

B22tg—20 to 31 inches, gray to light-gray (10YR 6/1) heavy silty clay loam; many, medium and coarse, prominent mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); moderate, coarse, blocky structure; firm, very sticky and very plastic; few roots; thin, discontinuous clay films; mica evident; strongly acid; clear, smooth boundary.

C1g—31 to 37 inches, gray (10YR 5/1) silt loam; many, medium, prominent mottles of yellowish brown (10YR 5/8); massive, grading toward thin platy; firm, slightly sticky and slightly plastic; micaceous; very strongly acid; clear, smooth boundary.

IIC2g—37 to 50 inches, gray to light-gray (10YR 6/1) stratified loam and fine sandy loam; friable; micaceous; very strongly acid.

The solum ranges from about 24 to 40 inches in thickness. Depth to bedrock ranges from 5 to more than 20 feet. Bedrock at a depth of less than 10 feet most commonly is mica schist. Smooth waterworn pebbles, or cobblestones, or both, are in the lower part of the solum and in the C horizon in places. Unless the soil is limed, reaction is strongly acid to extremely acid, and acidity generally increases with increasing depth. Matrix hue throughout the profile ranges from 10YR to 5Y, or the color is neutral.

The A horizon has a value of 3 to 5 and chroma of 0 to 2. Only the thin A1 horizon of an undisturbed profile has a value of 3.

The B horizon has a matrix value of 5 or 6 and matrix chroma of 0 to 2. This horizon is mottled in hue 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It ranges from heavy silty clay loam or heavy clay loam to clay.

The C horizon has about the same color range as the B horizon, but in many places is not mottled. It ranges from silt loam to sandy loam. This horizon is micaceous throughout, and in many places it is at least partly stratified.

Kinkora soils resemble Baile, Elkton, Fallsington, Leonardtown, Othello, and Watchung soils in color and natural drainage. They have a more clayey B horizon than Baile, Fallsington, Leonardtown, and Othello soils. They contain much mica, whereas Elkton and Watchung soils do not. They are more strongly acid than Watchung soils. They formed in the same general kind of old alluvium as the well drained Elsinboro soils and the moderately well drained Delanco soils.

Kinkora silt loam, 0 to 3 percent slopes (KrA).—This soil has the profile described as representative of the series. Included with it in mapping are accumulations of loamy soil material in slight depressions.

The soil is not only difficult to drain, but also difficult to work even if drained. It is sticky when wet and hard when dry. It rarely is used for cultivated crops, even though it does not deteriorate readily. Permanent improved pasture or permanent hay generally are the most intensive uses in farming. Many areas are in woodland, which is good habitat for some kinds of wildlife. Capability unit Vw-1; woodland subclass 1w.

Kinkora silt loam, 3 to 8 percent slopes (KrB).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is somewhat thinner. Included with this soil in mapping are a very few acres where the slope is more than 8 percent.

The soil takes up water very slowly, and since it is sloping, runoff is rapid. The hazard of erosion is moderate in cleared areas. The soil is suited to hay or improved pasture, but it generally is better suited to woodland and wildlife habitat. Capability unit VIw-2; woodland subclass 1w.

Legore Series

The Legore series consists of deep, well-drained, nearly level to steep soils on rolling to hilly uplands of the Piedmont Plateau. These soils formed in material weathered in place from such dark-colored basic rocks as diabase and gabbro. The native vegetation is mixed hardwoods dominated by oaks, but includes high base feeders, species that consume large amounts of calcium or other bases, such as black walnut and black locust.

In a representative profile the surface layer is brown or dark-brown light silty clay loam about 6 inches thick. The subsoil, about 24 inches thick, is reddish-brown to yellowish-red, firm silty clay loam that is sticky and plastic when wet. The underlying material from a depth of 30 inches to 60

inches is friable disintegrated rock of loam texture. It is variegated in color dominated by dark greenish gray and black.

If the moisture content is favorable, the Legore soils that are not severely eroded and are not too stony are fairly easy to work. Severely eroded soils are difficult to work because plowing to normal depth turns up the sticky and plastic subsoil. Legore soils are moderately permeable. They have high available water capacity and a high natural content of basic plant nutrients. Major limitations are slope, the hazard of erosion, and stoniness in places.

Representative profile of Legore silty clay loam, 8 to 15 percent slopes, severely eroded, in a cultivated area about one-fourth mile northwest of Benson:

Ap—0 to 6 inches, brown or dark-brown (7.5YR 4/4) light silty clay loam; moderate, coarse, granular and fine subangular blocky structure; friable, sticky and slightly plastic; common roots; slightly acid; abrupt, smooth boundary.

B21t—6 to 14 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, medium, blocky structure; firm, sticky and plastic; few roots; yellowish-red (5YR 4/6), discontinuous clay films; slightly acid; gradual, smooth boundary.

B22t—14 to 30 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, fine, subangular blocky structure; firm, sticky and plastic; very few roots; reddish-brown (5YR 4/3), discontinuous clay films; few fine fragments of weathered diabase; slightly acid; gradual, wavy boundary.

C—30 to 60 inches, highly variegated saprolite of loam texture; exfoliate rock-controlled structure; friable, slightly sticky; dominated by dark greenish-gray (5G 4/1) and black (10YR 2/1); medium acid.

The solum ranges from 20 to 34 inches in thickness. Depth to bedrock ranges from about 5 to 10 feet. Content of subangular pebbles of weathered rock ranges to as much as 10 percent in the upper part of the solum and to as much as 30 percent in the lower part and in the C horizon in places. Stones and boulders are common in many areas and characteristically show exfoliate or onion-type weathering. Reaction is medium acid to neutral.

The A horizon has a hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. Only the thin A1 horizon of an undisturbed profile has a value of 3. Normally the A horizon is silt loam, but in severely eroded places the plow layer commonly is silty clay loam.

The B horizon has a hue of 5YR or 7.5YR and is commonly redder in hue than the A horizon. It has a value of 4 or 5 and chroma of 2 to 4, or 6 in a subhorizon. The B horizon is silty clay loam.

The C horizon is characteristically variegated with brown, dark brown, strong brown, yellowish brown, greenish gray, dark gray, and black. Gray and black colors are inherent in the saprolite. The C horizon ranges from loam to silty clay loam.

Legore soils have a thinner solum but a higher base status than Neshaminy soils. They more nearly resemble Glenelg soils in drainage, thickness, and color, but lack the high content of mica of Glenelg soils and are not so strongly acid. They formed in the same general kind of residuum as the somewhat poorly drained Kelly soils, the poorly drained Watchung soils, and the redder Montalto soils that are thicker and contain more clay.

Legore silt loam, 3 to 8 percent slopes, moderately eroded (LeB2).—This soil has a plow layer of dark-brown or dark grayish-brown silt loam that is slightly sticky when wet. Average depth to the variegated underlying material is more than 30 inches. Otherwise this soil has a profile similar to the one described as representative of the series. Included in mapping are areas that have small amounts of of gravel in the surface layer, areas that have bedrock at less than 5 feet depth, and a few acres where the subsoil is more olive and less red in color than that described.

This soil is one of the richest in natural basic plant nutrients in the survey area. It is limited for farming only by the moderate hazard of erosion. The soil can be protected from further erosion by fairly simple, easily applied soil-conserving measures. It is fairly shallow over the underlying material, so soil losses are more damaging than on many of the deeper soils of the survey area. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after heavy rains. Using a winter cover crop and leaving crop residue to protect the surface between growing seasons are essential. Capability unit IIe-10; woodland subclass 2o.

Legore silt loam, 8 to 15 percent slopes, moderately eroded (LeC2).—This soil has a profile similar to that described as representative of the series, but the plow layer is dark-brown or dark grayish-brown silt loam that is slightly sticky when wet. Included in mapping are areas that have small amounts of gravel in the surface layer, areas where bedrock is at a depth of less than 5 feet, and a few acres where the subsoil is more olive and less red in color than described. Small areas have been graded or otherwise disturbed.

Natural fertility of this soil is better than average. The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. This soil is fairly shallow over the underlying material, so soil losses are more damaging than on many of the deeper soils of the county. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-10; woodland subclass 2o.

Legore silt loam, 15 to 25 percent slopes, moderately eroded (LeD2).—This soil has a plow layer of dark-brown or dark grayish-brown silt loam that is slightly sticky when wet. Average depth to the variegated underlying material is less than 30 inches. Otherwise this soil has a profile similar to the one described as representative of the series. Included in mapping are areas that have small amounts of gravel and areas where the subsoil is darker and contains more clay than is typical. Also included are areas where the subsoil is more olive and less red than described and a few acres that have somewhat impeded subsoil drainage.

The hazard of further erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. This soil is fairly shallow over the underlying material, so soil losses are more damaging than on many of the deeper soils of the county. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used.

This soil is better suited to hay, pasture, sodded orchards, and woodland than to cultivated crops. Even under the best management, this soil generally is unsuited to cultivated crops. Capability unit IVe-10; woodland subclass 2r.

Legore silt loam, 25 to 45 percent slopes (LeE).—This soil has a surface layer of dark-brown or dark grayish-brown silt loam that is slightly sticky when wet. Average depth to the variegated underlying material is about 24 inches. Otherwise this soil has a profile similar to the one described as representative of the series. Including in mapping are areas that have small amounts of gravel, places where the red subsoil is darker and contains more clay than is typical, and a few areas where the subsoil is more olive and less red in color than described. Also included are a few acres that

have somewhat impeded subsoil drainage and a few acres where the slope is more than 45 percent. Most of this soil is still in woodland.

This soil is so steep and the hazard of erosion is so severe that it is unsuited to any tilled crops. It is suited, however, to hay or pasture, and in places to particularly well-managed sodded orchards. It is well suited to wood crops, wildlife habitat, and watershed protection. Capability unit VIe-3; woodland subclass 2r.

Legore very stony silt loam, 0 to 15 percent slopes (LfC).—This soil has a profile similar to that described as representative of the series, but the surface layer, which has not been seriously eroded, is silt loam. The soil also is very stony. The stones, commonly diabase, are more than 1 foot in diameter and on the average less than 30 feet apart. Included in mapping are small areas where the subsoil is more olive and less red in color than that described.

This soil is suited to woodland. Cultivation is impractical unless most of the stones are removed. If some stones are removed, hay crops and pasture can be grown. Most areas are in woodland, which produces timber and furnishes good wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2o.

Legore very stony silt loam, 15 to 25 percent slopes (LfD).—This soil has a profile similar to that described as representative of the series, but the surface layer, which has not been seriously eroded, is silt loam. The soil also is very stony. The stones, commonly diabase, are more than 1 foot in diameter and on the average are less than 30 feet apart. Included in mapping are small areas where the subsoil is more olive and less red in color than described.

This soil is well suited to woodland, but is limited because of slope. Cultivation is impractical. If some stones are removed, hay crops and pasture can be grown. Most areas are still in woodland, which produces timber and furnishes wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2r.

Legore very stony silt loam, 25 to 45 percent slopes (LfE).—This soil has a profile similar to that described as representative of the series, but the surface layer, which has not been seriously eroded, is silt loam. The soil also is generally thinner to the variegated underlying material, and it is very stony. The stones, commonly diabase, are more than 1 foot in diameter and on the average are less than 30 feet apart. Included in mapping are small areas where the subsoil is more olive and less red in color than that described, and a few acres where the slope is more than 45 percent.

The soil is well suited to woodland, which produces wood crop products and furnishes good wildlife habitat and watershed protection. It is too steep and too stony for cultivated crops or improved pasture. Capability unit VIIs-3; woodland subclass 2r.

Legore silty clay loam, 8 to 15 percent slopes, severely eroded (LgC3).—This soil has the profile described as representative of the series. The thin surface, or plow, layer consists chiefly of subsoil material that has been turned up and mixed with whatever remained of the original silt loam surface layer. In places the surface layer is almost entirely subsoil material, and many shallow and a few deeper gullies have formed. Included in mapping are areas that have small amounts of gravel, mostly on the surface, and areas where bedrock is at a depth of about 5 feet. Also included are areas where the subsoil is thicker than that described, in some of which it is darker red and contains more clay than is typical, and a few areas where the subsoil is more olive and less red in color than that described.

The hazard of further erosion is very severe if the soil is tilled. Intensive soil-conserving measures are needed. The soil is fairly shallow over the underlying material, so soil losses are more damaging than on many of the deeper soils of the survey area. Contour stripcropping is effective if strips are appropriately narrow and if a suitable crop rotation is used.

This soil is better suited to hay, pasture, and sodded orchards than to tilled crops. It is also suited to planted woodland. Capability unit IVe-10; woodland subclass 2o.

Legore silty clay loam, 15 to 25 percent slopes, severely eroded (LgD3).—This soil has a profile similar to that described as representative of the series, but in many places the surface layer consists of the original subsoil material, which has been turned and mixed by plowing, and in other places the undisturbed subsoil is exposed at the surface. Gullies are common, and some have cut through the subsoil into the more friable underlying material. Included in mapping are areas that have small to moderate amounts of gravel, mostly on the surface; areas where bedrock is at a depth of less than 5 feet; and areas where the subsoil is thicker than that described, in some of which it is darker red and contains more clay than is typical. Also included are areas where the subsoil is more olive and less red in color than that described, and small areas that have somewhat impeded subsoil drainage.

This soil is not suited to cultivated crops. It is suited to limited hay production and to limited grazing of carefully managed pasture. Some areas are suited to sodded orchards. Many areas are suited to woodland plantings for wood crop production and for watershed protection. Capability unit VIe-3; woodland subclass 2r.

Leonardtown Series

The Leonardtown series consists of poorly drained, nearly level soils of the Coastal Plain. These soils are on upland flats that do not have channeled drainageways, and are moderately deep over a fragipan. They formed in loamy deposits underlain by very old loamy materials. The native vegetation is wetland hardwoods, including red maple and sweetgum.

In a representative profile the surface layer is silt loam about 7 inches thick. It is dark gray in the upper 4 inches and gray mottled with yellowish brown in the lower 3 inches. The upper part of the subsoil, about 9 inches thick, is gray to greenish-gray firm heavy silt loam mottled with yellowish brown. The lower part of the subsoil, about 17 inches thick, is a dense and brittle silty clay loam fragipan. It is gray to greenish gray mottled with yellowish brown and light olive brown. The underlying material from a depth of 33 inches to 45 inches is also a fragipan of dark-gray mottled loam. From a depth of 45 inches to 60 inches the underlying material is gray, mottled firm loam.

Leonardtown soils are fairly easy to work if the moisture content is favorable. They are wet in spring and slow to warm up, so planting dates generally are delayed. These soils are slowly permeable, and in wet seasons they have a perched water table, from near the surface to the fragipan. Available water capacity is moderate. In dry seasons, Leonardtown soils dry out more quickly and thoroughly than other poorly drained soils that do not have a fragipan. These soils have severe limitations for most nonfarm uses.

Representative profile of Leonardtown silt loam, in a wooded area about two miles east of Aberdeen:

A1—0 to 4 inches, dark-gray (5Y 4/1) silt loam; weak, fine, granular structure; friable; many roots; strongly acid; clear, smooth boundary.

A2—4 to 7 inches, gray (N 5/0) silt loam; few, fine, distinct mottles of yellowish brown (10YR 5/6); weak, thin, platy and fine granular structure; friable, slightly sticky; many roots; strongly acid; clear, smooth boundary.

B2tg—7 to 16 inches, gray (5Y 5/1) grading to greenish-gray (5GY 6/1) heavy silt loam; many, coarse, prominent mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm, slightly sticky and slightly plastic; common roots; thin, discontinuous clay films; strongly acid; clear, smooth boundary.

Bx1—16 to 24 inches, gray (5Y 5/1) grading to greenish-gray (5GY 5/1) silty clay loam; many, coarse, prominent mottles of light olive brown (2.5Y 5/6) and yellowish brown (10YR 5/8); moderate, very coarse, prismatic and moderate, medium, platy structure; dense; firm and brittle, sticky and plastic; thin clay films; strongly acid; gradual, smooth boundary.

Bx2—24 to 33 inches, gray (5Y 5/1) grading to greenish-gray (5GY 5/1) light silty clay loam; many, coarse, prominent mottles of light olive brown (2.5Y 5/6); strong, very coarse, prismatic and strong, thick, platy structure; very dense; very firm and brittle, slightly sticky and slightly plastic; thin clay films; very strongly acid; clear, smooth boundary.

IICx—33 to 45 inches, dark-gray (5Y 4/1) loam; many, coarse, prominent mottles of strong brown (7.5YR 5/8); weak, thin, platy structure; very dense; firm and brittle, slightly sticky; very strongly acid; gradual, wavy boundary.

IIC2g—45 to 60 inches, gray (N 5/0) loam; common, medium, prominent mottles of brown (7.5YR 5/4); massive; firm, slightly sticky; strongly acid.

The solum ranges from about 28 to 40 inches in thickness, and the fragipan from about 28 to 44 inches. Bedrock is at an undetermined great depth. The solum essentially is free of coarse fragments, but a gravelly IIIC horizon is below the fragipan in a few places. Matrix hue throughout the profile is 2.5Y to 5GY, or the color is neutral. Unless the soil is limed, reaction is strongly acid to extremely acid.

The A horizon has a value of 3 to 6 and chroma of 0 to 2. Only the thin A1 horizon of some undisturbed profiles has a value of 3. The A horizon has high-chroma mottling in a few places.

The B horizon has a matrix value of 5 or 6 and matrix chroma of 1 or 2. This horizon has high-chroma mottling throughout, in hues of 10YR, 2.5Y, or 7.5YR. It is silt loam or silty clay loam.

The C horizon has a matrix value of 4 to 6 and matrix chroma of 0 or 1. Mottling in this horizon is similar to that in the B horizon. This horizon is sandy loam or loam and rarely silt loam.

Leonardtown soils resemble Baile, Elkton, Fallsington, Kinkora, Othello, and Watchung soils in color and natural drainage. They differ from all those soils, however, in having a fragipan. They formed in the same general kind of loamy sediment as the poorly drained Othello soils, the moderately well drained Beltsville and Mattapex soils, and the well-drained Chillum and Matapeake soils.

Leonardtown silt loam (Lr).—This is a nearly level, poorly drained soil, and water moves through it slowly. In most areas very little water runs off, so the soil above the fragipan is saturated in wet seasons. The hazard of erosion is slight. Included in mapping are local accumulations of silt, a few small areas where the slope is more than 2 percent, and small areas that have been filled or otherwise disturbed.

Artificial drainage is difficult to manage. Drainage ditches generally function better than tile drains. If the soil is drained, it is suited to some annual crops, most commonly corn. Undrained areas are suited to seasonal pasture and to woodland and wildlife habitat. Capability unit IVw-3; woodland subclass 3w.

Loamy and Clayey Land

Nearly level to steep Loamy and clayey land in the Harford County Area consists mostly of very old clay deposits on the upper part of the Coastal Plain, overlain by more recent deposits of sandy loam, loam, or silt loam. The loamy mantle varies widely in thickness and texture. A series of test pits or borings into this land reveals a different soil condition at nearly every spot.

The loamy mantle varies in color from gray through yellow and brown to almost red. It varies in thickness from almost none to several feet. It rests abruptly over clay, but is not related in any way to the clay. In places the clay is somewhat sandy, but in most places it is not. The clay can be almost any color or mixture of colors, including red, purplish red, gray, yellow, brown, pink, and white. It can be at the surface, or exposed in one place, or deeply covered by loamy material at another place a few feet away.

The clay is very plastic and sticky when wet, but its most important characteristic is its poor stability. Cuts through this clay are difficult to stabilize, and the clay slides, slumps, or flows down the surface of the cut and onto roads or other areas below it. Stability is even poorer where the clay has been disturbed, as in land leveling or filling.

Permeability is variable in the mantle and slow in the clay. In places the mantle contains fine smooth gravel. Flat fragments of "ironstone," sandy material cemented by iron, are in the mantle, most commonly where the mantle is sandy loam.

This land has a variable but commonly low available water capacity, is very low in content of plant nutrients, and is poorly suited to farming. Major limitations are available water capacity, plant-nutrient content, slope and the hazard of erosion, and poor workability where the clay is within plow depth. Most areas are in woodland, are idle, or are in residential and other nonfarm uses.

This land, particularly where it has been disturbed or graded, is severely limited and at times dangerous for some uses. The clay flows, slumps, or slides when wet, particularly under pressure or load, so it squeezes out from beneath building foundations, allowing footings or basement to crack and settle, and in extreme cases causing severe damage. Banks and fills of this material have been known to collapse, causing serious and expensive damage to property and even injury and death in instances.

Loamy and clayey land, 0 to 5 percent slopes (LyB).—This land is difficult to farm because of its complex nature, so only a very small acreage is farmed. The hazard of erosion is severe unless the surface is well protected. Capability unit IIIe-42; woodland subclass 3c.

Loamy and clayey land, 5 to 15 percent slopes (LyD).—Little or none of this land is used in farming. The hazard of erosion is severe unless the surface is well protected. Limited grazing is possible in some areas, but the land is better suited to woodland and to wildlife habitat. Capability unit VIe-2; woodland subclass 3c.

Loamy and clayey land, 15 to 30 percent slopes (LyE).—This land is severely limited for all purposes by its physical characteristics, the slope, and by the very severe hazard of erosion. It can be used only as woodland and wildlife habitat. Capability unit VIIe-2; woodland subclass 3c.

Manor Series

The Manor series consists of deep, well-drained to somewhat excessively drained, gently sloping to steep soils on the Piedmont Plateau. These soils formed in materials deeply weathered in place from acid crystalline rocks,

mostly mica schists, and consequently they contain large amounts of mica. They are on large areas of hilly uplands, and are the most extensive soils in the survey area. The native vegetation is mixed upland hardwoods, mainly oaks. Virginia pine has invaded some areas.

In a representative profile the surface layer is brown or dark-brown loam about 8 inches thick. The subsoil, about 15 inches thick, is yellowish-red and strong-brown, friable micaceous loam. The underlying material from a depth of 23 inches to 56 inches is multicolored, very friable, disintegrated micaceous rock of fine sandy loam texture.

Manor soils are easy to work. They are moderately permeable to moderately rapidly permeable and have moderate available water capacity. They are among the most susceptible to erosion in the Harford County Area, but they are suited to farming and to many nonfarm uses. Slope, the hazard of erosion, and stoniness are slight to severe limitations.

Representative profile of Manor loam, 8 to 15 percent slopes, moderately eroded, in a cultivated area on Grafton Shop Road, near Forest Hill:

Ap—0 to 8 inches, brown or dark-brown (7.5YR 4/4) loam; weak, fine, granular structure; very friable; many roots; common fine mica flakes; medium acid; clear, smooth boundary.

B2—8 to 18 inches, yellowish-red (5YR 5/6) loam; weak, fine, subangular blocky structure; friable, very slightly sticky; many roots; many fine mica flakes; strongly acid; gradual, smooth boundary.

B3—18 to 23 inches, strong-brown (7.5YR 5/6) loam; very weak, fine, subangular blocky structure; friable; few roots; many mica flakes; strongly acid; clear, wavy boundary.

C—23 to 56 inches, highly variegated fine sandy loam; rock-controlled structure; very friable; few roots in upper part; highly micaceous; strongly acid.

The solum ranges from about 15 to 24 inches in thickness. Depth to bedrock ranges from about 6 to more than 10 feet. Content of mica flakes is characteristic of all horizons and increases in quantity with increasing depth. Many places are about 15 to 25 percent flat fragments of weathered mica schist, mostly less than 3 inches long. Angular fragments of hard white quartzite, remnants of quartzite intrusions, occur in thin seams and in places are scattered on and near the surface. Many areas are very stony. Unless the soil is limed, reaction is strongly acid or very strongly acid.

The A horizon has a hue of 10YR to 5YR, value of 4 or 5, and chroma of 2 to 4. It is loam or channery loam.

The B horizon has a hue, commonly 5YR, but in places 7.5YR and 2.5YR, value of 4 or 5, and chroma of 4 to 8. This horizon is loam or light silt loam, or their channery analogues.

The C horizon is highly variegated but is dominantly brown, yellow, and yellowish red. This horizon is loam or fine sandy loam. The A, B, and C horizons do not differ significantly in clay content.

Manor soils do not closely resemble any other soils of the Harford County Area. They are closely associated with Brandywine soils, but they generally are redder, contain fewer coarse fragments, and have a much higher mica content. They formed in the same general kind of micaceous material as Chester, Elioak, Glenelg, and Glenville soils, but all of those soils contain more clay in the B horizon. They also have better natural drainage than Glenville soils.

Manor loam, 3 to 8 percent slopes, moderately eroded (MbB2).—In most areas this soil has lost part of its original surface layer. In a few areas it is more severely eroded, and scattered shallow gullies have formed. Included in mapping are small areas where the subsoil is less red and more brown than the one described in the representative profile and areas in which the subsoil and underlying material contain moderate quantities of fine and very fine gravel. Also included are a few nearly level areas and wooded areas that have not been significantly eroded.

The soil is suited to commonly grown crops and to pasture, orchards, and woodland, but is one of the more easily eroded soils of the survey area. If it is well protected and well managed, however, the hazard of further erosion is only moderate. Farming on the contour is effective in controlling erosion, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using a cover crop and crop residue to protect the surface between cropping seasons are essential. Capability unit IIe-25; woodland subclass 2o.

Manor loam, 8 to 15 percent slopes, moderately eroded (MbC2).—This soil has the profile described as representative of the series. In most areas it has lost part of the original surface layer, and some shallow gullies have formed. Included in mapping are small areas where the subsoil is less red and more brown than the one described in the representative profile, and some wooded areas that have not been significantly eroded.

The hazard of erosion is severe if the soil is tilled and is not well protected. Contour stripcropping in narrow strips, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using cover crops and crop residues to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is suited to woodlands, but erosion is a hazard. The greater than average erodibility of this soil must be considered. Most areas have been put to more intensives uses. Capability unit IIIe-25; woodland subclass 2r.

Manor loam, 8 to 15 percent slopes, severely eroded (MbC3).—This soil has lost most or all of its original surface layer. The plow layer mostly is what was once subsoil material. It is dominantly yellowish red, and many mica flakes are evident. Gullies are fairly common (fig. 8), some of which extend deeply into the friable, highly micaceous underlying material, which generally is at a depth of about 15 inches.

The hazard of further erosion is severe, and the soil generally is not suited to cultivated crops. Intensive soil-conserving measures are needed if the soil is to be tilled. Contour stripcropping is effective if the strips are appropriately narrow and a suitable crop rotation is used.

This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Woodland furnishes wood crop products, wildlife habitat, and watershed protection. Capability unit IVe-25; woodland subclass 2r.

Manor loam, 15 to 25 percent slopes, moderately eroded (MbD2).—This soil has lost a large part of the original surface layer through erosion. Plowing to normal depth turns up part of the yellowish-red subsoil in places and freshly worked areas appear spotted. Included in mapping are shallow and deep gullies and wooded areas that have not been significantly eroded.

The hazard of further erosion is severe, and the soil generally is not suited to cultivated crops. Intensive soil-conserving measures are needed if the soil is to be tilled. Contour stripcropping is effective if strips are appropriately narrow and a suitable crop rotation is used.

This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Woodland furnishes wood crop products, wildlife habitat, and watershed protection. Capability unit IVe-25; woodland subclass 2r.

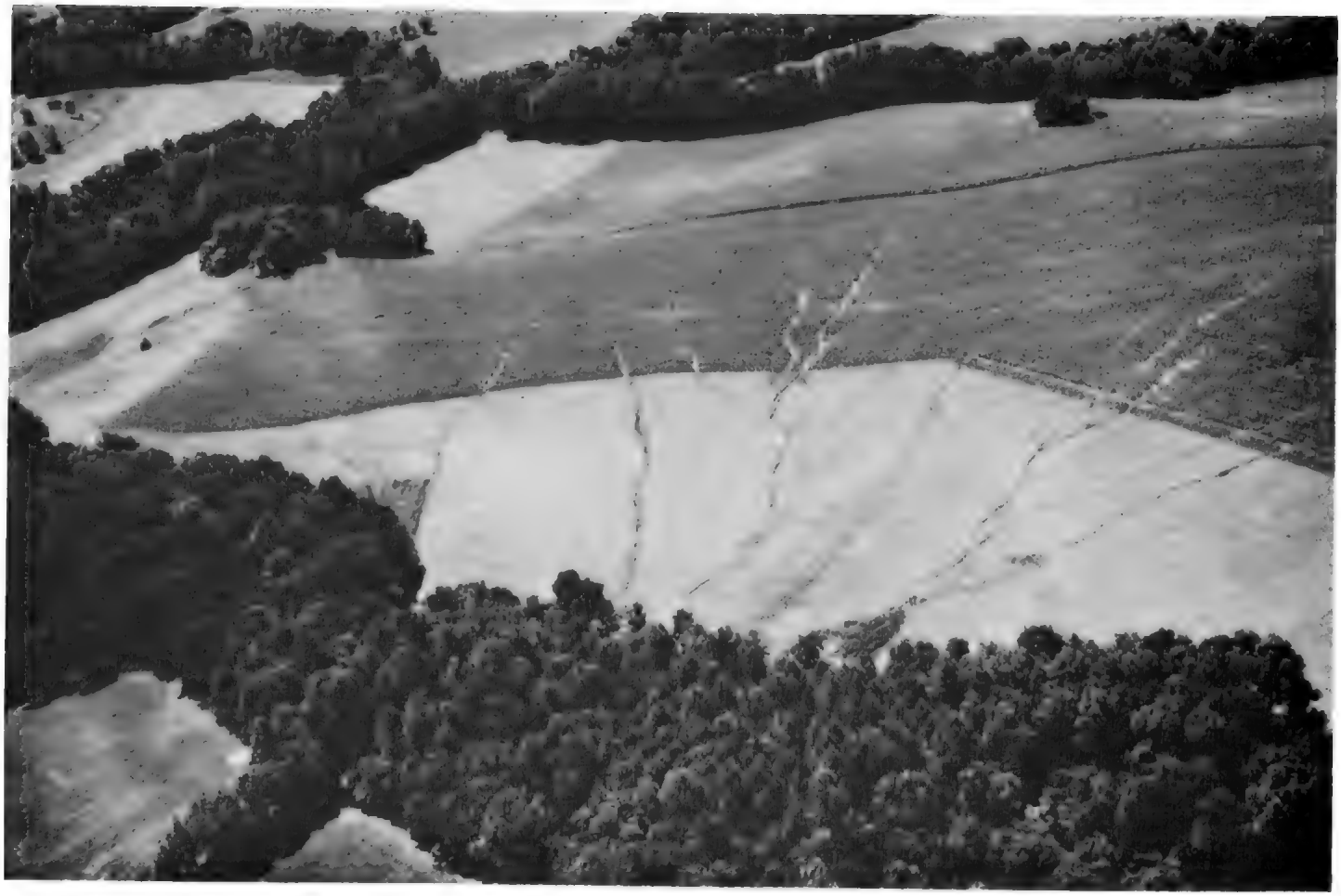

Figure 8.—**Strongly sloping, severely eroded Manor loam.**

Manor loam, 15 to 25 percent slopes, severely eroded (MbD3).—In most places this soil has lost all of its original surface layer and the plow layer is what was once subsoil material. It is dominantly yellowish red, and many mica flakes are evident. Undisturbed subsoil is exposed on the surface in many places. Gullies are common, many of which extend deeply into the very friable, highly micaceous underlying material, which, between gullies, is at a depth of about 15 inches.

This soil generally is not suited to cultivated crops. It is suited to limited hay production and to limited grazing of carefully managed pasture. Some areas are suited to sodded orchards. Many are suited to wood crops, wildlife habitat, and watershed protection. Capability unit VIe-3; woodland subclass 2r.

Manor channery loam, 3 to 8 percent slopes, moderately eroded (McB2).—This soil has a profile similar to that described as representative of the series, but throughout it contains flat fragments of weathered mica schist, mostly less than 3 inches in length. Content of these channery fragments averages between 15 and 25 percent and generally increases with increasing depth. Depth to bedrock is less, on the average, than in the nonchannery Manor loams, but is still at least 6 feet. Most areas of this soil have lost a part of the original surface layer. Included in mapping are a few severely eroded spots and shallow gullies and some wooded areas that have not been significantly eroded.

Unless well protected, this is one of the more easily eroded soils of the survey area. If it is well managed, however, the hazard of further erosion is only moderate. The channery mica schist is abrasive to farm implements and interferes with the preparation of a fine seedbed.

The soil is suited to commonly grown crops, pasture, orchards, and woodland. Farming on the contour is effective in checking erosion, particularly if properly installed waterways are used to collect and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using cover crops and crop residues to protect the surface between cropping seasons are essential. Capability unit IIe-25; woodland subclass 2o.

Manor channery loam, 8 to 15 percent slope, moderately eroded (McC2).—This soil has a profile similar to that described as representative of the series, but throughout it contains flat fragments of weathered mica schist, mostly less than 3 inches in length. Content of these channery fragments averages between 1 and 25 percent and generally increases with increasing depth. Depth to bedrock is less, on the average, than in the nonchannery Manor loams, but is still at least 6 feet. Most areas of this soil have lost a part of the original surface layer. Included in mapping are

shallow gullies and wooded areas that have not been significantly eroded. Some small areas have been graded or otherwise disturbed.

Unless well protected, this is one of the more easily eroded soils of the county. The hazard of erosion is severe if it is tilled. The channery mica schist is abrasive to farm implements and interferes with the preparation of a fine seedbed. Contour stripcropping, particularly in narrow strips and combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using cover crops and crop residues to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is suited to woodland, but its erodibility has to be considered in management. Most areas have been put to more intensive uses. Capability unit IIIe-25; woodland subclass 2r.

Manor channery loam, 8 to 15 percent slopes, severely eroded (McC3).—This soil has lost most or all of its original surface layer. The plow layer chiefly is subsoil material. It is dominantly yellowish red and is about 15 percent or more flat fragments of schist. Erosion causes these rock fragments to accumulate on the surface of the soil and in rills and gullies. Gullies are fairly common, some of which extend deeply into the friable, channery and highly micaceous underlying material that generally is at a depth of about 15 inches.

The channery mica schist is abrasive to farm implements and interferes with the preparation of a fine seedbed. The hazard of further erosion is very severe, and the soil generally is not suited to cultivated crops. Intensive soil-conserving measures are needed if the soil is to be tilled. Contour stripcropping is effective if strips are appropriately narrow and a suitable crop rotation is used.

This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Woodland furnishes wood crop products, wildlife habitat, and watershed protection. Capability unit IVe-25; woodland subclass 2r.

Manor channery loam, 15 to 25 percent slopes, moderately eroded (McD2).—This soil has lost a large part of its original surface layer. Plowing to normal depth turns up part of the yellowish-red subsoil in places, and freshly worked areas appear spotted. Included in mapping are shallow and deep gullies and wooded areas that have not been significantly eroded.

The plow layer is about 15 percent or more flat fragments of schist that are abrasive to farm implements and interfere with the preparation of a fine seedbed. The hazard of further erosion is very severe, and the soil generally is not suited to cultivated crops. Intensive soil-conserving measures are needed if the soil is to be tilled. Contour stripcropping is effective if strips are appropriately narrow and a suitable crop rotation is used.

This soil is better suited to hay, pasture, sodded orchards, or woodland than to tilled crops. Woodland furnishes wood crop products, wildlife habitat, and watershed protection. Capability IVe-25; woodland subclass 2r.

Manor channery loam, 15 to 25 percent slopes, severely eroded (McD3).—This soil has lost all of its original surface layer in most places. The plow layer is dominantly yellowish-red subsoil material that is about 20 percent or more flat fragments of schist. Undisturbed subsoil is exposed in places. Erosion causes the channery schist to accumulate on the surface of the soil, in gullies, and on the lower parts of slopes. Gullies are common, many of which extend into the very friable, channery and highly micaceous underlying material which, between gullies, is at a depth of about 15 inches.

This soil generally is not suited to cultivated crops. It is suited to limited hay production and to limited grazing of carefully managed pasture. Some areas are suited to sodded orchards. Many are suited to trees for wood crop production, wildlife habitat, and watershed protection. Capability unit VIe-3; woodland subclass 2r.

Manor very stony loam, 25 to 45 percent slopes (MdE).—This soil has a profile similar to the one described as representative of the series, but it is very stony and is somewhat less deep over bedrock. The stones are commonly of mica schist or granitized schist. They are more than 1 foot in diameter, and on the average less than 30 feet apart. Some of the stones are hard white quartzite. Included in mapping are small areas where the stones are mostly slabs of hard black slate, and other areas where the underlying material is largely shattered gneiss. Also included are a few acres where the slope is more than 45 percent. Some of the rougher areas contain large boulders and a few outcrops of hard bedrock.

This soil is well suited to woodland, which furnishes wood crop products, good wildlife habitat, and watershed protection. It is too steep and much too rough and stony for cultivated crops or improved pasture. Capability unit VIIs-3; woodland subclass 2r.

Manor soils, 25 to 45 percent slopes (MfE).—This mapping unit consists of all of the steep, nonstony soils of the Manor series in the Harford County Area. In general, these soils have a profile similar to that described as representative of the series, but they are only about 15 inches deep over the very friable, micaceous underlying material. They are nearly free of rock fragments in many places, but in others they are as much as 30 percent flat fragments of weathered mica schist. Some areas are gradations between these two conditions. Included in mapping are a few small areas where the slope is more than 45 percent.

Most areas remain under woodland cover, but where the land has been cleared, most commonly for grazing, there have been moderate to severe losses of soil through erosion. These soils generally are not suited to cultivated crops. They are suited, in a limited way and under very careful management, for hay or pasture. Some areas are suited to sodded orchards. Wooded areas should remain so, for wood crop production, wildlife habitat, and watershed protection. Capability unit VIe-3; woodland subclass 2r.

Manor and Glenelg very stony loams, 3 to 15 percent slopes (MgC).—This mapping unit is about two-thirds Manor very stony loam and one-third Glenelg very stony loam. Some areas consist of both soils, and others of only one. Each soil has a profile similar to the one described as representative of its respective series, but is very stony and in most areas has not been eroded significantly. Stones, commonly mica schist or granitized schist, are on the surface and throughout the soil. They are more than 1 foot in diameter and, on the average, less than 30 feet apart. Some of these stones are hard, white quartzite. Included in mapping are small areas where the underlying material consists largely of shattered gneiss.

These soils are better suited to woodland than to other uses. Unless most of the stones are removed, cultivation is

impractical. If some stones are removed, hay crops and pasture can be managed. Most areas are still in woodland, which produces timber and furnishes good wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2r.

Manor and Glenelg very stony loams, 15 to 25 percent slopes (MgD).—This mapping unit is about three-fourths Manor very stony loam and about one-fourth Glenelg very stony loam. Each soil has a profile similar to the one described as representative of its respective series, but it is very stony. Stones, commonly of mica schist or granitized schist, are on the surface and throughout the soil. They are more than 1 foot in diameter, and on the average, less than 30 feet apart. Some of these stones are hard, white quartzite. Included in mapping are small areas where the stones are mostly slabs of hard black slate, and other areas where the underlying material consists largely of shattered gneiss.

These soils are well suited to woodland. They are somewhat limited by slope. Cultivation is entirely impractical. If some stones are removed, hay crops and pasture can be managed. Most areas are still in woodland, which produces timber and furnishes wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2r.

Matapeake Series

The Matapeake series consists of deep, well-drained, nearly level and gently sloping soils on broad, smooth uplands of the Coastal Plain. These soils formed in old deposits of loamy material and underlying older, coarser textured sediment. The native vegetation is mixed upland hardwoods.

In a representative profile the surface layer is brown or dark-brown silt loam about 9 inches thick. The upper 23 inches of the subsoil is firm yellowish-brown and brown heavy silt loam and light silty clay loam that is rather sticky when wet. The lower 8 inches, transitional to the underlying material, is yellowish-brown friable loam that contains a few fine mica flakes. The underlying material from a depth of 40 inches to 60 inches is stratified friable fine sandy loam that contains mica; it is strong brown in the upper 14 inches and yellowish red in the lower 6 inches.

Matapeake soils are fairly easy to work if the moisture content is favorable. They are moderately permeable and have high available water capacity. They have few limitations, for either farm or nonfarm uses, except for slope and the accompanying hazard of erosion.

Representative profile of Matapeake silt loam, 2 to 5 percent slopes, in an idle area about 1 mile southeast of Aberdeen:

Ap—0 to 9 inches, brown or dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; medium acid; abrupt, smooth boundary.

B21t—9 to 25 inches, yellowish-brown (10YR 5/4) heavy silt loam; moderate, fine and medium, subangular blocky structure; firm, slightly sticky and slightly plastic; common roots; thin, mostly discontinuous clay films; strongly acid; gradual, smooth boundary.

B22t—25 to 32 inches, brown (7.5YR 5/4) light silty clay loam; moderate, medium and coarse, subangular blocky structure; firm, sticky and plastic; few roots; thin, continuous clay films; strongly acid; clear, wavy boundary.

IIB3—32 to 40 inches, yellowish-brown (10YR 5/4) loam; weak, medium and coarse, subangular blocky structure; friable, slightly sticky and slightly plastic; few fine mica flakes; strongly acid; gradual, wavy boundary.

IIC1—40 to 54 inches, strong-brown (7.5YR 5/6) fine sandy loam; stratified; friable; few, fine, black (10YR 2/1) concretions; some fine mica; very strongly acid; gradual, wavy boundary.

IIC2—54 to 60 inches, yellowish-red (5YR 5/6) fine sandy loam; massive; friable; few, fine, smooth quartz pebbles; common fine mica flakes; very strongly acid.

The solum ranges from about 26 to 40 inches in thickness. Bedrock is at an undetermined great depth. Fine smooth quartz pebbles are in the C horizon in places. The presence or absence of mica in the C horizon does not characterize the series. Unless the soil is limed, reaction of the solum is strongly acid or very strongly acid, and acidity commonly increases with increasing depth. The C horizon is extremely acid in places.

The A horizon has a hue of 10YR or 2.5Y, value of 3 to 6, and chroma of 1 to 4. Only the thin A1 horizon of an undisturbed profile has value of 3 and chroma of 1. Only the A2 horizon, where present, has value of 6.

The B horizon has a hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6, or rarely 8. This horizon is silt loam or silty clay loam, but the B3 horizon, not present in all profiles, is loam, sandy loam, or fine sandy loam.

The C horizon varies widely in color and texture, depending on the nature of the unconforming material. Hue ranges from 5YR to 5Y, the value is commonly 4 to 7, and the chroma commonly 3 to 8. This horizon ranges from fine sandy loam to sand. In places where the C horizon is loamy sand or sand, the transition from the Bt horizon is more than 5 inches.

Matapeake soils resemble Chester, Glenelg, Elsinboro, and Sassafras soils. They are not stratified like Elsinboro soils and are much deeper over bedrock than Chester, Elsinboro, and Glenelg soils. They have a much higher silt content and much lower sand content in the solum than Sassafras soils. They formed in the same general kind of loamy sediment as Chillum soils, which are only moderately deep over a hard, commonly gravelly substratum, and as the moderately well drained Beltsville and Mattapex soils and the poorly drained Leonardtown and Othello soils.

Matapeake silt loam, 0 to 2 percent slopes (MkA).—This soil has a profile similar to that described as representative of the series, but the silt loam plow layer is commonly a little thicker. Included in mapping are a few acres where the silty clay loam subsoil extends to a depth of more than 50 inches and the underlying material dominantly is more loamy than sandy. Also included are areas where there are accumulations of silt on the surface. Some small areas have been filled or otherwise disturbed.

The soil is suited to all crops commonly grown in the survey area. It has no serious limitations for farming. Good management includes the application of fertilizer, lime, and manure; minimum tillage; and the use of a cover crop or crop residue to protect the surface between cropping seasons. Capability unit 1-4; woodland subclass 3o.

Matapeake silt loam, 2 to 5 percent slopes (MkB).—This soil has the profile described as representative of the series. Included in mapping are areas where the loamy material extends to a depth of more than 50 inches and a few acres where a moderate amount of surface soil has been lost through erosion. Some small areas have been filled or otherwise disturbed.

This is an excellent soil, limited for farming only by a moderate hazard of erosion. Management needs include fertilizers, lime, and manure; minimum tillage; the use of cover crops or crop residue to protect the surface between cropping seasons; and the use of a suitable crop rotation. Sodded waterways and well-constructed outlets are needed to collect and dispose of surface runoff water. Capability unit IIe-4; woodland subclass 3o.

Mattapex Series

The Mattapex series consists of deep, moderately well drained, nearly level and gently sloping soils on broad, smooth uplands and in slight depressions within areas of other soils of the Coastal Plain. These soils formed in old

deposits of loamy material over older, coarser sediment. The native vegetation is mixed water-tolerant hardwoods.

In a representative profile the surface layer is brown or dark-brown silt loam about 7 inches thick. The yellowish-brown subsoil extends to a depth of about 38 inches. In sequence from the top, the upper 4 inches of subsoil is friable, heavy silt loam that is slightly sticky when wet; the next 27 inches is firm, light silty clay loam mottled with grayish brown and strong brown in the lower 15 inches. It is sticky when wet. The underlying material from a depth of 38 inches to 60 inches is yellowish-brown, mottled, firm loam.

Mattapex soils are fairly easy to work if the moisture content is favorable. They are moderately wet in spring and rather slow to warm up, so planting occasionally is delayed. These soils are moderately slowly permeable, and seasonally they have a free water table within a depth of about 2 feet. Available water capacity is high. Mattapex soils have moderate to severe limitations for many nonfarm uses.

Representative profile of Mattapex silt loam, 0 to 2 percent slopes, in a rewooded area about 1½ miles east of Aberdeen:

Ap—0 to 7 inches, brown or dark-brown (10YR 4/3) silt loam; moderate, medium, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, fine, subangular blocky structure; friable, slightly sticky; common roots; very strongly acid; gradual, wavy boundary.

B21t—11 to 23 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; common roots; thin, discontinuous clay films; very strongly acid; gradual, wavy boundary.

B22t—23 to 38 inches, yellowish-brown (10YR 5/4) light silty clay loam; many, medium, distinct mottles of grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm, sticky and plastic; few roots; thin, discontinuous clay films; very strongly acid; gradual, smooth boundary.

IIC—38 to 60 inches, yellowish-brown (10YR 5/4) loam; many, medium and coarse, distinct mottles of grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6); massive; firm, slightly sticky; very strongly acid.

The solum ranges from about 30 to 40 inches in thickness. Bedrock is at an undetermined great depth. The solum essentially is free of coarse fragments, but fine smooth quartz pebbles are in the C horizon in places. Unless the soil is limed, reaction is strongly acid to extremely acid, and acidity commonly increases with increasing depth. The matrix hue is 10YR or 2.5Y throughout the profile.

The A horizon has a value of 3 to 5 and chroma of 1 to 4. Only the thin A1 horizon of an undisturbed profile has value of 3 and chroma of 1.

The B horizon has a matrix value of 5 or 6 and matrix chroma of 4 to 8. Mottles in chroma of 2 or less are in the lower part of the B horizon, but characteristically are absent in the B1 horizon or in the upper 10 inches of the Bt horizon. Some high-chroma mottling is also in the B horizon in places. This horizon is silt loam or silty clay loam.

The C horizon is similar in color to the lower part of the B horizon. It commonly is loam, sandy loam, or fine sandy loam. In places where this horizon is sand or loamy sand, the transition from the Bt horizon is more than 5 inches.

Mattapex soils resemble Delanco, Keyport, and Woodstown soils in color, morphology, and natural drainage. They contain less clay in the B horizon than Keyport soils, contain less sand and coarse fragments in the B horizon than Delanco soils, and contain much more silt and less sand in the solum than Woodstown soils. They are much deeper over bedrock than Delanco soils. They formed in the same general kind of loamy sediment as the well drained Chillum and Matapeake soils, the moderately well drained Beltsville soils, which have a fragipan, and the poorly drained Leonardtown and Othello soils.

Mattapex silt loam, 0 to 2 percent slopes (MIA).—This soil has the profile described as representative of the series. Included in mapping are a very few acres where the surface layer is a little more sandy than is typical.

Erosion generally is not a hazard. The soil is wet in winter and spring and does not warm up early. Drainage improvement is necessary for some crops, particularly early planted ones. Such perennial crops as alfalfa are subject to damage by frost heaving in winter and early in spring. Either tile or ditches are effective in improving drainage. In places it is necessary to intercept and divert runoff from higher adjacent soils. Capability unit IIw-1; woodland subclass 3o.

Mattapex silt loam, 2 to 5 percent slopes (MIB). This soil has a profile similar to the one described as representative of the series, but the surface layer is somewhat thinner. Included in mapping are a few small areas where the surface layer is a little more sandy than typical and some scattered moderately eroded areas. Also included are a few areas where the slope is more than 5 percent.

The soil is suited to most crops and to pasture, woodland, and wildlife habitat. It is not well suited to perennial crops that are damaged by frost heaving. The hazard of erosion is moderate, and this generally is more important in farming than impeded internal drainage. Artificial drainage may be needed for some crops, particularly early planted ones. A winter cover crop should be grown or crop residue left on the surface between cropping seasons to control erosion. Capability unit IIe-16; woodland subclass 3o.

Montalto Series

The Montalto series consists of deep, well-drained, nearly level to moderately sloping soils, mostly on rolling uplands of the Piedmont Plateau. These soils formed in materials deeply weathered in place from dark-colored basic rocks, chiefly diabase and gabbro. The native vegetation is mixed hardwoods, dominantly oaks, but includes high base feeders, such as black walnut and black locust.

In a representative profile the surface layer is silt loam about 11 inches thick. It is dark brown in the upper 4 inches and reddish brown in the lower 7 inches. The subsoil, about 47 inches thick, is dominantly firm reddish-brown and dark-red silty clay that is sticky and plastic when wet. The underlying material, from a depth of 58 inches to 74 inches, is red friable silt loam that is streaked with yellow. Hard diabase bedrock is at a depth of 74 inches. Weathered diabase stones occur throughout the profile.

Nonstony Montalto soils are fairly easy to work at a favorable moisture content, unless the sticky subsoil is penetrated. These soils are moderately slowly permeable. They have high available water capacity and fairly high natural content of basic plant nutrients. In areas not too sloping or too stony, they are well suited to farming. Montalto soils are limited for some nonfarm uses by moderately slow permeability, by slope and the hazard of erosion, and locally by stoniness.

Representative profile of Montalto very stony silt loam, in a wooded area of Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes, on the east side of U.S. Highway 1, south of Bel Air:

A1—0 to 4 inches, dark-brown (7.5YR 3/2) silt loam; weak, medium, granular structure; friable, slightly sticky; many roots; many diabase stones; medium acid; clear, smooth boundary.

A2—4 to 11 inches, reddish-brown (5YR 4/4) silt loam; moderate, coarse, granular structure; friable, slightly sticky and slightly plastic; many roots; many diabase stones; medium acid; clear, smooth boundary.

B1—11 to 15 inches, red (2.5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm, sticky and slightly plastic; common roots; many diabase stones; medium acid; clear, smooth boundary.

B21t—15 to 38 inches, reddish-brown (2.5YR 4/4) silty clay; moderate, medium, blocky structure; firm, sticky and plastic; common roots; reddish-brown (5YR 4/4) distinct clay films; many diabase stones; medium acid; gradual, wavy boundary.

B22t—38 to 58 inches, dark-red (2.5YR 3/6) silty clay; moderate, medium, subangular blocky structure; firm, sticky and plastic; very few roots; weak-red (10R 4/4) prominent clay films; many diabase stones; medium acid; gradual, wavy boundary.

C—58 to 74 inches, red (2.5YR 4/8) silt loam, streaked with yellow (10YR 7/6); rock-controlled structure; friable, slightly sticky; few diabase stones; slightly acid; abrupt, wavy boundary.

R—74 inches, hard diabase.

The solum ranges from about 40 to 60 inches in thickness. Depth to bedrock ranges from about 5 feet to 12 feet. Subangular pebbles of weathered rock range to as much as 10 percent in the upper part of the solum and to as much as about 20 percent in the lower part of the solum and in places in the C horizon. Stones and boulders are common in many areas, and characteristically show exfoliate or onion-type weathering. Reaction ranges from strongly acid to slightly acid, and acidity commonly decreases with increasing depth.

The A horizon has a hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 2 to 4. Only the thin A1 horizon of an undisturbed profile has a value of 3.

The B horizon has a hue of 5YR to 10R, and in many places becomes redder with increasing depth. The value is 3 or 4, and the chroma is 4 to 8. This horizon is clay or silty clay in the finest part, but is silty clay loam or clay loam that is low in sand in thin subhorizons in many places.

The C horizon has a wide range of color. Most commonly it is red, or red variegated with other colors. This horizon is loam, clay loam, silt loam, or silty clay loam.

Montalto soils resemble Elioak soils in color, texture, and natural drainage. In contrast they have a thicker solum, are not micaceous, contain more bases, and are less acid. They formed in the same general kind of residuum as Legore soils, which are thinner and less red in color, and as the somewhat poorly drained Kelly soils and the poorly drained Watchung soils.

Montalto silt loam, 0 to 3 percent slopes (MsA).—This soil has the profile described as representative of the series, but it contains few, if any, stones. In cultivated areas the plow layer is brown or dark brown. Included in mapping are a few acres that have surface washing and local accumulations of loamy soil material in slight depressions. Some small areas have been graded, filled, or otherwise disturbed.

The soil is well suited to all crops commonly grown in the survey area. It has no serious limitations for farming. Good management includes appropriate applications of fertilizer and manure, and in places lime, but the lime requirement of the soil generally is low. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential. This is one of the better soils for farming in the Harford County Area. Capability unit I-4; woodland subclass 2c.

Montalto silt loam, 3 to 8 percent slopes, moderately eroded (MsB2).—This soil has a profile similar to that described as representative of the series, but it contains few, if any, stones. Most areas have been cultivated and have lost a part of the original surface layer through erosion. The plow layer is brown or dark-brown silt loam about 6 to 8 inches thick. Included in mapping are a few acres where the surface layer is a little finer and more sticky than described, local galled spots and shallow gullies, and a few wooded areas that have not been significantly eroded.

This soil is limited in use for farming only by the moderate hazard of erosion. It can be protected from further erosion by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after heavy rains. Between cropping seasons the surface should be protected by a cover crop or by crop residue left in place. Capability unit IIe-4; woodland subclass 2c.

Montalto silt loam, 8 to 15 percent slopes, moderately eroded (MsC2).—This soil has a profile similar to that described as representative of the series, but it contains few, if any, stones. Most areas have been cultivated and have lost a part of the original surface layer through erosion. The plow layer is brown or dark-brown silt loam about 6 inches thick. Plowing to normal depth turns up a part of the red sticky subsoil in places, and freshly worked areas appear spotted. Included in mapping are shallow gullies, a few acres where the surface layer is a little finer textured and more sticky than described, and a few wooded areas that have not been significantly eroded.

The hazard of erosion is severe if the soil is tilled. Intensive soil-conserving measures are needed. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after heavy rains. Keeping tillage to a minimum and using cover crops and crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is also well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2c.

Neshaminy Series

The Neshaminy series consists of deep, well-drained, nearly level to steep soils of the Piedmont Plateau. These soils formed in material deeply weathered in place from semibasic rocks or mixed basic and acidic rocks. They are on rolling to hilly uplands. The native vegetation is mixed hardwoods that are dominantly oaks but includes high base feeders, such as black walnut and black locust.

In a representative profile the surface layer is silt loam about 9 inches thick. It is dark brown in the upper 4 inches and brown in the lower 5 inches. The subsoil, about 40 inches thick, is dominantly yellowish-red, friable silty clay loam in the upper 19 inches and reddish-brown, firm clay loam in the lower 21 inches. The subsoil is sticky when wet. The underlying material, which extends from a depth of 49 inches to 64 inches, is variegated friable silt loam. Hard diorite bedrock is at a depth of 64 inches.

Nonstony Neshaminy soils are easy to work at a favorable moisture content, unless the sticky subsoil is penetrated. Neshaminy soils are moderately permeable and have a high available water capacity and a fairly high natural content of basic plant nutrients. They are well suited to farming in areas that are not too steep or too stony. Neshaminy soils are limited for some nonfarm uses by slope and erosion, and locally by stoniness.

Representative profile of Neshaminy silt loam in an uneroded wooded included area in Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded, on U.S. Highway 1 (bypass), just south of Bel Air:

A1—0 to 4 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; strongly acid; clear, smooth boundary.

A2—4 to 9 inches, brown (7.5YR 5/4) silt loam; weak, medium, granular structure; friable, slightly sticky and slightly plastic; many roots; strongly acid; clear, smooth boundary.

B1—9 to 12 inches, brown or dark-brown (7.5YR 4/4) light silty clay loam; moderate, medium, subangular blocky structure; friable, sticky and slightly plastic; common roots; medium acid; gradual, smooth boundary.

B21t—12 to 28 inches, yellowish-red (5YR 4/6) silty clay loam; moderate and strong, medium, subangular blocky structure; friable, sticky and slightly plastic; common roots; dark-brown (10YR 3/3), discontinuous clay films; medium acid; gradual, smooth boundary.

B22t—28 to 49 inches, reddish-brown (5YR 4/4) clay loam; moderate, medium, blocky structure; firm, sticky and plastic; very few roots; brown or dark-brown (7.5YR 4/4), discontinuous clay films; medium acid; diffuse boundary.

C—49 to 64 inches, variegated reddish-yellow (5YR 6/6), brownish-yellow (10YR 6/6), and black (10YR 2/1) silt loam; rock-controlled structure; friable, slightly sticky; gritty; slightly acid; abrupt, wavy boundary.

R—64 inches, hard, fine-grained diorite.

The solum ranges from about 36 to 54 inches in thickness. The depth to bedrock ranges from about 4 to 10 feet. Angular pebbles of hard quartzite and stones of quartzite or acidic and basic rock are common in many areas. Reaction ranges from strongly acid to slightly acid, and acidity commonly decreases with increasing depth.

The A horizon has a hue of 10YR or 7.5YR, a value of 3 to 5, and a chroma of 2 to 4. Only the A1 horizon in some undisturbed profiles has a value of 3.

The B horizon commonly has a hue of 7.5YR in the upper part, but becomes redder with increasing depth and is 5YR or even 2.5YR in places. It has a value of 4 or 5 and a chroma of 4 to 8. This horizon is mainly silty clay loam or clay loam. In places this soil has a B3 horizon of sandy clay loam.

The C horizon has about the same color range as the B horizon, but in many places it has variegated colors that cover a wider range, particularly in hue, and it commonly contains some black mineral material. This horizon is silt loam, loam, or sandy loam.

Neshaminy soils somewhat resemble Chester soils, but have a thicker solum and a higher level of natural basic plant nutrients, are less strongly acid, and in some places are redder in the lower part of the solum. They are not so red as Elioak and Montalto soils and do not have as much clay in the B horizon.

Neshaminy silt loam, 0 to 3 percent slopes (NeA).—In wooded areas this soil has a profile like the one described as representative of the series, but most of the acreage of this soil is in cultivated areas and the plow layer is brown or dark grayish-brown silt loam about 8 to 10 inches thick.

This soil is well suited to all crops commonly grown in the survey area. It has no serious limitations. Erosion is no more than a slight hazard. Good management includes the application of fertilizer, lime, and manure; minimum tillage; and a cover crop or crop residue to protect the surface in winter. Capability unit I-4; woodland subclass 2o.

Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded (NeB2).—In an uneroded wooded area this soil has the profile described as representative of the series, but in most areas it has been cultivated and has lost a part of its original surface layer through erosion. The present plow layer is brown or dark grayish-brown silt loam about 6 to 8 inches thick. Included in mapping are a few acres where the surface layer is somewhat finer textured and stickier than described, some local galled spots and shallow gullies, and a few wooded areas, including the uneroded site of the representative profile.

The only limitation in farming is the moderate hazard of further erosion. The soil can be protected by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, especially if properly installed sodded waterways are used to collect and dispose of surface runoff after heavy rains. In winter, the surface should be protected by a cover crop or by crop residues left in place. Capability unit IIe-4; woodland subclass 2o.

Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded (NeC2).—This soil has a profile generally like the one described as representative of the series, but in most areas it has been cultivated and has lost part of its original surface layer through erosion. The present plow layer is brown or dark grayish-brown silt loam about 6 inches thick. A few shallow gullies have formed. Included in mapping are a few acres where the surface layer is somewhat finer textured and stickier than described and a few wooded areas that have not been significantly eroded.

The hazard of further erosion is severe in areas that are tilled regularly unless intensive soil-conserving measures are applied. Contour stripcropping, particularly along with a suitable crop rotation, is effective in conserving soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after heavy rains. Plowing to normal depth in places turns up part of the sticky subsoil. Tillage should be kept to a minimum and the surface protected between cropping seasons by a cover crop or crop residue.

This soil is well suited to cultivated crops, hay, pasture, and sodded orchards. It is also well suited as woodland, but most of the acreage is used more intensively. Capability unit IIIe-4; woodland subclass 2o.

Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes (NsC).—Some areas of this mapping unit are entirely Neshaminy very stony silt loam, some are entirely Montalto very stony silt loam, and some contain both. Acreages of the two soils are about equal in the Harford County Area. The Neshaminy soil has a profile like the one described as representative of the Neshaminy series, but it is very stony. The Montalto soil has the profile described as representative of the Montalto series. Neither soil is significantly eroded. Both are stony on the surface and throughout the profile. The stones are commonly dark-colored basic rock. They are more than 1 foot in diameter and on the average, less than 30 feet apart. In the Neshaminy soil some are light-colored acidic rock.

These soils are best suited to woodland. Cultivation is impractical unless most of the stones are removed. Hay and pasture can be grown if some stones are removed. Most areas are still woodland, which produces timber and furnishes good wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2o.

Neshaminy and Montalto very stony silt loams, 15 to 25 percent slopes (NsD).—This mapping unit is about 75 percent Neshaminy very stony silt loam and 25 percent Montalto very stony silt loam. Each soil has a profile similar to the one described as representative of its respective series, but each is very stony on the surface and throughout the profile. The stones are dark-colored basic rock in the Montalto soil and are commonly mixed dark-colored basic and light-colored acidic rocks in the Neshaminy soil. They are more than 1 foot in diameter and on the average, less than 30 feet apart. Neither soil is significantly eroded.

These soils are well suited as woodland, but slope is a limitation in management. Cultivation is impractical. If some stones are removed, hay and pasture can be grown. Most areas are still woodland that produces timber and furnishes wildlife habitat and watershed protection. Capability unit VIs-3; woodland subclass 2r.

Neshaminy and Montalto very stony silt loams, 25 to 45 percent slopes (NsE).—A little more than half of this mapping unit is Neshaminy very stony silt loam, and the rest is mostly Montalto very stony silt loam. Each soil has a profile similar to the one described as representative of its

respective series, but each is very stony on the surface and throughout the profile and tends to be somewhat less deep over bedrock. The stones are dark-colored basic rock in the Montalto soil and are commonly mixed dark-colored basic and light-colored acidic rocks in the Neshaminy soil. They are more than 1 foot in diameter and no more than 30 feet apart. In many places they are more closely spaced. In some of the rougher areas there are large boulders and a few outcrops of hard bedrock. Included in mapping are some small areas where subsoil drainage is somewhat impeded and a few acres where the slope is more than 45 percent.

These soils are well suited to woodland, which produces wood products and furnishes good wildlife habitat and watershed protection. They are too steep and much too rough and stony for cultivated crops or improved pasture. Capability unit VIIs-3; woodland subclass 2r.

Othello Series

The Othello series consists of deep, poorly drained, nearly level soils on upland interfluvial flats of the Coastal Plain. These soils formed in old loamy deposits underlain by coarser sediment. The native vegetation is wetland hardwoods, mostly oaks, gums, red maple, and holly.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsoil is about 26 inches thick. It is friable grayish-brown silt loam in the upper part and gray or greenish-gray silty clay loam in the lower part. It has many prominent strong-brown and yellowish-brown mottles and is sticky and plastic when wet. The underlying material from a depth of 33 inches to 60 inches is gray to light-gray friable fine sandy loam that is mottled with yellowish red.

Othello soils are fairly easy to work if the moisture content is favorable. The water table is seasonally at or very near the surface, and the soil is slow to warm up in spring. These soils are moderately slowly permeable. If artificially drained they are well suited to farming. Drainage is only moderately difficult. Available water capacity is high. Othello soils have severe limitations for most nonfarm uses.

Representative profile of Othello silt loam, in an idle area about 2½ miles east of Aberdeen:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable, slightly sticky; many roots; medium acid; abrupt, smooth boundary.

B21tg—7 to 20 inches, grayish-brown (2.5Y 5/2) silt loam; many, medium and coarse, prominent mottles of strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6), and few, fine, distinct mottles of greenish gray (5GY 5/1); weak, fine, subangular blocky structure; friable, sticky and plastic; common roots; thin, discontinuous clay films; strongly acid; gradual, smooth boundary.

B22tg—20 to 33 inches, gray (5Y 5/1) grading to greenish-gray (5GY 6/1) silty clay loam; many, coarse, prominent mottles of strong brown (7.5YR 5/6); very weak, thin, platy structure and moderate, fine and medium, subangular blocky structure; firm, sticky and plastic; few roots; thin, continuous clay films; visible fine mica; very strongly acid; clear, smooth boundary.

IICg—33 to 60 inches, gray or light-gray (5Y 6/1) fine sandy loam; many, coarse, prominent mottles of yellowish red (5YR 4/6); massive; friable, slightly sticky; gritty; common fine mica flakes; very strongly acid.

The solum ranges from about 24 to 40 inches in thickness. Bedrock is at an undetermined great depth. Fine, smooth quartz pebbles are in the C horizon in places. Unless the soil is limed, reaction is strongly acid to extremely acid and acidity commonly increases with increasing depth. Matrix hue throughout the profile ranges from 10YR to 5Y, or the color is neutral.

The A horizon has a value of 4 to 6 and chroma of 0 to 2. Only the A2 horizon, where present, has value of 6.

The B horizon has a value of 5 to 7 and chroma of 0, 1, or 2. Most mottling is in hue 10YR or 7.5YR, value of 5 or 6, and chroma of 1 to 8, but most commonly 6. In places low-chroma mottling is in hue 5GY. This horizon is silt loam or silty clay loam.

The C horizon has about the same color range as the B horizon. This horizon is commonly loam, sandy loam, or fine sandy loam, but in places part of it is sand or loamy sand. In these places the transition from the Bt horizon is more than 5 inches.

Othello soils resemble Baile, Elkton, Fallsington, Kinkora, Leonardtown, and Watchung soils in color and natural drainage. They have a less clayey B horizon than Elkton, Kinkora, and Watchung soils. They lack the large mica component of Baile and Kinkora soils and do not have the fragipan of Leonardtown soils. They have much more silt and much less sand in the solum than Fallsington soils. They formed in the same general kind of loamy sediment as Leonardtown soils, the well drained Chillum and Matapeake soils, and the moderately well drained Beltsville and Mattapex soils.

Othello silt loam (Ot).—This soil is nearly level. Erosion is not a hazard. Loamy material has accumulated in some slight depressions. Included in mapping are a few acres where the slope is more than 2 percent. Some small areas have been filled or otherwise disturbed.

If fieldwork can begin early in spring, general farm crops and truck crops can be grown. For this purpose tile drains or open ditches are needed to dispose of excess water. Even in drained areas, such perennial crops as alfalfa are subject to severe damage by frost heaving in winter. Row crops commonly are grown in strips between ditches or tile lines, and some farmers grade the surface slightly to facilitate drainage toward these ditches or tiles. Most undrained areas still support stands of water-tolerant hardwoods. Capability unit IIIw-7; woodland subclass 3w.

Sand and Gravel Pits

Sand and gravel pits (Sa) are excavations from which sand or gravel or other materials are removed, mainly for road fill or other kinds of construction. Included in mapping are large borrow pits from which soil is excavated, mainly for fill. Also included in mapping are pits from which iron ore, clay, or stone have been removed.

Possible uses for any of these areas must be determined onsite at each location. Some areas can be used for further exploitation, for water impoundments, or for solid waste disposal. Capability unit VIIIs-4; woodland subclass not assigned.

Sassafras Series

The Sassafras series consists of deep, well-drained, gently sloping to steep soils dominantly on undulating uplands, and on some short steeper slopes of the Coastal Plain. These soils formed in old marine deposits of sandy sediment containing moderate amounts of silt and clay. The native vegetation is mixed hardwoods, mainly oaks. Virginia pine has invaded in places.

In a representative profile the surface layer is brown to dark-brown loam about 8 inches thick. The upper 26 inches of the subsoil is dominantly strong-brown, friable light sandy clay loam that is slightly sticky when wet. The lower 6 inches is brown, friable sandy loam. The underlying material to a depth of 60 inches is brown to dark-brown, loose loamy sand.

Sassafras soils are easy to work unless they are wet. They are moderately permeable and have moderate to high

available water capacity. They have few limitations, for either farm or nonfarm uses, except for slope and the accompanying hazard of erosion.

Representative profile of Sassafras loam, 2 to 5 percent slopes, moderately eroded, in an idle area south of Swan Creek, about 1 mile east of Aberdeen:

Ap—0 to 8 inches, brown or dark-brown (10YR 4/3) loam; moderate, medium, granular structure; friable; many roots; medium acid; abrupt, smooth boundary.

B1—8 to 12 inches, brown (7.5YR 5/4) heavy sandy loam; weak, medium, subangular blocky structure; friable; many roots; strongly acid; gradual, smooth boundary.

B21t—12 to 22 inches, strong-brown (7.5YR 5/6) light sandy clay loam; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; thick, continuous clay films; strongly acid; gradual, smooth boundary.

B22t—22 to 34 inches, brown (7.5YR 5/4) light sandy clay loam; moderate, medium, subangular blocky structure; friable, sticky and plastic; few roots; thick, continuous clay films; very strongly acid; gradual, wavy boundary.

B3—34 to 40 inches, brown (7.5YR 5/4) sandy loam; weak, fine and medium, subangular blocky structure; friable; very few roots; extremely acid; gradual, wavy boundary.

C—40 to 60 inches, brown or dark-brown (7.5YR 4/4) loamy sand; single grained; loose; strongly acid.

The solum ranges from about 30 to 40 inches in thickness. Bedrock is at an undetermined great depth. A few, fine, smooth quartz pebbles are in the solum in places, and make up about 10 to 30 percent of the C horizon in places. Unless the soil is limed, reaction is strongly acid to extremely acid and acidity commonly increases with increasing depth.

The A horizon has a hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 1 to 4. Only the thin A1 horizon of an undisturbed profile has value of 3 and chroma of 1. The A horizon is sandy loam or loam.

The B horizon has a hue most commonly of 7.5YR but in places 5YR; the value is 5 or 6, and the chroma is 4 to 8. This horizon most commonly is sandy clay loam, but in places is loam and heavy sandy loam. The transitional B3 horizon, where present, is sandy loam.

The C horizon has a hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. In most places this horizon is one color, but it is variegated in a few places. This horizon ranges from sandy loam to sand. In places where it is loamy sand or sand, the transition from the Bt horizon is more than 5 inches.

Sassafras soils resemble Chester, Glenelg, Elsinboro, and Matapeake soils. They are not stratified like Elsinboro soils and are much deeper over bedrock than Chester, Glenelg, and Elsinboro soils. They have a much lower silt content and much higher sand content in the solum than Matapeake soils. They formed in the same general kind of marine sediment as the moderately well drained Woodstown soils and the poorly drained Fallsington soils.

Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded (ShB2).—This soil has a profile similar to that described as representative of the series, but the surface, or plow, layer contains more sand, generally a little less clay, and less silt than does the plow layer of Sassafras loam. In most places this soil has lost a part of the original surface layer through erosion, and a few places are severely eroded. Some small areas have been filled, graded, or otherwise disturbed.

This soil is well suited to nearly all commonly grown crops. Fairly simple soil-conserving measures can be applied to control further erosion. Farming on the contour is effective. Carefully graded and sodded waterways are needed to collect and dispose of surface runoff after exceptionally heavy rains. Crop rotations are appropriate. A cover crop or crop residue left in place is needed to protect the surface between cropping seasons. Capability unit IIe-5; woodland subclass 3o.

Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded (ShC2).—In most areas this soil has lost a few inches of its original surface layer through erosion. There are a few scattered shallow gullies and a few galled spots where erosion has exposed or nearly exposed the subsoil. Included in mapping are a very few acres where the surface layer is mostly sand. Some small areas have been filled, graded, or otherwise disturbed.

The hazard of erosion, particularly by washing, is severe. If the soil is properly managed, it is well suited to hay, pasture, and orchard crops. If slopes are long enough, contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving both soil and water. Cover crops and crop residue are needed to protect the surface between cropping seasons. Capability unit IIIe-5; woodland subclass 3o.

Sassafras loam, 2 to 5 percent slopes, moderately eroded (SlB2).—This soil has the profile described as representative of the series. In most areas the soil has lost a few inches of its original surface layer through erosion, and a few shallow gullies have formed. Most slopes are smooth and fairly long, but locally slopes are short and irregular. Included in mapping are small depressions and a few acres that are more nearly level.

Except for the moderate hazard of erosion, this soil has few limitations. It is well suited to most crops and uses. It can be protected from further erosion damage by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. A cover crop or crop residue left in place is needed to protect the surface between cropping seasons. Capability unit IIe-4; woodland subclass 3o.

Sassafras loam, 5 to 10 percent slopes, moderately eroded (SlC2).—In most areas this soil has lost 3 to 6 inches of its original surface layer through erosion. Some gullies have cut into, but not through, the subsoil, and there are some scattered galled spots. Included in mapping are areas where the surface layer, particularly the subsoil, contains more silt and less sand than described. Also included are some small wooded areas that have been little affected by erosion. Some small areas have been filled, graded, or otherwise disturbed.

The hazard of further erosion is severe on this soil if it is tilled. Intensive soil-conserving measures are needed. If slopes are long enough, contour stripcropping, particularly if combined with suitable crop rotation, is effective in conserving both soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops and crop residues to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and orchard crops. It is also well suited to woodland, but most areas have been put to more intensive use. Capability unit IIIe-4; woodland subclass 3o.

Sassafras and Joppa soils, 10 to 15 percent slopes (SsD).—This mapping unit contains either Sassafras soils or Joppa soils, or in some places both. These soils are similar. Joppa soils are gravelly throughout, whereas Sassafras soils are not, and in places Sassafras soils are less sandy than Joppa soils. They do not differ greatly in use and management. Included in mapping are areas where the underlying material is hard and brittle, a few acres that have somewhat restricted subsoil drainage, and minor areas where the soil is more loamy than is typical for either Sassafras or Joppa soils. Also included are areas that have

been more or less severely eroded, and some gullies and galled spots.

Slope and the severe hazard of erosion make these soils generally not suited to cultivated crops. If these soils are tilled, special protective measures are needed to control further erosion. The soils are better suited to pasture, hay crops, orchard crops, woodland, and wildlife habitat. Capability unit IVe-5; woodland subclass 3o.

Sassafras and Joppa soils, 15 to 30 percent slopes (SsE).—This mapping unit consists of about equal parts of Sassafras and Joppa soils. Joppa soils are gravelly, whereas Sassafras soils are not. The two soils do not differ significantly in use or management, particularly since both are strongly sloping to steep. Included in mapping are sandy areas, loamy areas, and areas where the subsoil or underlying material is hard and brittle. Also included are areas where the subsoil is very red, and some small areas that are not well drained. Some areas have been graded or otherwise disturbed.

The hazard of erosion is so severe that cultivation should not be attempted. The soils are better suited to pasture, orchard crops, woodland, and wildlife habitat. Most areas of these soils have at least some woodland cover. Capability unit VIe-2; woodland subclass 3r.

Stony Land, Steep

Stony land, steep (St) is mainly on heights above the Susquehanna River, but occurs as small areas elsewhere in the Harford County Area, mainly on bluffs above streams and ravines. It consists of areas that are much too stony and too steep for normal soil development. Most stones are 1 to 2 feet in diameter, but some are larger boulders. They are about 1 to 3 feet apart on the average. The kinds of stones vary from area to area. The most common stones are chlorite schist, granitized schist, and gneiss, but in some places the stones mainly are gabbro, diorite, or related kinds. Included in mapping are scattered areas of bedrock outcrop. Most slopes are more than 45 percent, and some are as much as 75 percent. In many places the terrain is rough and irregular.

Stony land, steep, is not useful in farming. It produces limited amounts of wood products, but woodland management generally is impractical and uneconomic. This land furnishes habitat for some kinds of wildlife and has some esthetic value. Capability unit VIIIs-1; woodland subclass 5x.

Swamp

Swamp (Sw) consists of small areas under fresh water all, or nearly all, of the time. The soil material is mostly silt in some areas and mostly sand in others, along with much partly decomposed organic matter in most places.

Swamp is not used for farming. It is commonly wooded with red maple, swamp magnolia, and ash. These trees are considered mostly noncommercial, because growth and quality are generally poor and woodland management is generally impractical and uneconomical. Swamp is very good habitat for some kinds of wildlife. Capability unit VIIw-1; woodland subclass not assigned.

Tidal Marsh

Tidal marsh (Tm) consists of many small areas and a few fairly large areas that are regularly covered by tidal waters. These areas border parts of Chesapeake Bay and parts of tidal streams and estuaries. The soil material ranges from sand to clay and in some places it is peaty or mucky. Most areas are high in salt, but a few are only brackish. In some places the material contains sulfur compounds, and when this material is drained and dried it is exceedingly acid. The vegetation is marsh grasses and sedges and some salt-tolerant herbs and low shrubs.

None of this land in its present condition is suited to crops, pasture, or woodland. It provides habitat for a number of kinds of wildlife, however, and along with its waterways, provides outdoor recreation. Capability unit VIIIw-1; woodland subclass not applicable.

Watchung Series

The Watchung series consists of deep, poorly drained, nearly level to gently sloping soils of the Piedmont Plateau. These soils formed in materials weathered in place from such hard basic rocks as diabase. They are on upland flats and in depressions, in areas around the heads of drains, and on foot slopes adjacent to minor drainageways, many of which do not have channels. The native vegetation is mostly water-tolerant oaks and other wetland hardwoods. Cleared idle areas commonly support sedges, grasses, herbs, and shrubs.

In a representative profile the surface layer is silt loam about 12 inches thick. It is dark grayish brown in the upper 5 inches and grayish brown in the lower 7 inches. The upper 28 inches of the subsoil is firm, gray to light-gray and olive-gray clay and heavy silty clay loam that is variously mottled and mostly very sticky and very plastic when wet. The lower 8 inches is firm, strong-brown heavy silty clay loam that has gray mottles. It is sticky when wet. The underlying material to a depth of 78 inches is firm, greenish-gray, mottled clay loam that is sticky when wet.

Watchung soils are difficult to work because they are sticky when wet, are hard and cloddy if dry, and in many areas are very stony. They seldom are cultivated. The water table is seasonally at, or very near, the surface, and the soil is slow to warm up in spring. These soils are slowly permeable. If they are artificially drained by a system of ditches, they are suited to improved pasture. Drainage is slow and commonly difficult. Available water capacity is high. Watchung soils have severe limitations for most nonfarm uses.

Representative profile of Watchung silt loam, 0 to 3 percent slopes, in an unimproved pasture near Berkeley:

A1—0 to 5 inches, dark grayish-brown (2.5Y 4/2) silt loam; few, fine, distinct mottles of dark reddish brown (5YR 3/4); weak, fine, granular structure; friable, slightly sticky and slightly plastic; many roots; medium acid; clear, smooth boundary.

A2g—5 to 12 inches, grayish-brown (2.5Y 5/2) silt loam; common, medium, distinct mottles of brown or dark brown (7.5YR 4/4); very weak, very thin, platy structure; friable, sticky and slightly plastic; common roots; medium acid; clear, smooth boundary.

B21tg—12 to 18 inches, gray or light-gray (10YR 6/1) clay; many, medium, prominent mottles of strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8); moderate, medium, blocky structure; firm, very sticky and very plastic; few roots; thin, discontinuous clay films; medium acid; gradual, wavy boundary.

B22tg—18 to 28 inches, gray or light-gray (N 6/0) clay; strong, medium, prismatic and blocky structure; very firm, very sticky and very plastic; few roots between prisms; continuous, light olive-brown (2.5Y 5/4) clay films on prism exteriors; interiors

mottled with strong brown (7.5YR 5/8); medium acid; clear, wavy boundary.

B23tg—28 to 40 inches, olive-gray (5Y 5/2) heavy silty clay loam; strong, medium and coarse, prismatic structure; firm, sticky and very plastic; dark olive-gray (5Y 3/2) thick clay films on prism exteriors; interiors mottled with yellowish brown (10YR 5/8) and greenish gray (5G 5/1); slightly acid; abrupt, smooth boundary.

B3—40 to 48 inches, strong-brown (7.5YR 5/6) heavy silty clay loam; few, medium, prominent mottles of gray (5Y 5/1); weak, coarse, prismatic structure; firm, sticky and plastic; distinctly gritty; slightly acid; gradual, irregular boundary.

Cg—48 to 78 inches, greenish-gray (5G 5/1) clay loam; many, medium, prominent mottles of strong brown (7.5YR 5/8); rock-controlled structure; firm, sticky and slightly plastic; very gritty; neutral.

The solum ranges from about 24 to 48 inches in thickness, but the maximum depth to the base of the Bt horizon is 40 inches. Horizons that have a dominant chroma of more than 2 are not present above a depth of 30 inches. Depth to bedrock ranges from 5 to 10 feet. Pebbles, cobblestones and stones, or both, are common in many places, and many areas of Watchung soils are very stony. Reaction is medium acid to neutral, and acidity decreases with increasing depth.

The A horizon has a matrix hue of 10YR to 5Y, matrix value of 3 to 5, and matrix chroma of 1 to 4. Only the thin A1 horizon of some undisturbed profiles has value of 3. Except where mixed by plowing, this horizon has high-chroma mottling in most places.

The B horizon has a matrix hue of 7.5YR to 5GB, or the color is neutral. Only the B3 horizon has hue of 7.5YR or 10YR. The Bt horizon has matrix value of 4 to 6 and matrix chroma of 0 to 2, or rarely 3 in the lower part. Most mottles are in hue 10YR to 5YR, value of 4 or 5 and chroma of 4 to 8; in places low-chroma mottles are in hue 5GY or greener. The B horizon ranges from silty clay loam to clay.

The C horizon widely ranges in matrix hue from 7.5YR to 5G; matrix value is 4 to 6 and chroma is 0 to 6. Mottles or variegations and contrasting chroma are common. This horizon is clay loam, silt loam, or silty clay loam.

Watchung soils resemble Baile, Elkton, Fallsington, Kinkora, Leonardtown, and Othello soils in color and natural drainage. They lack the high mica content of Baile and Kinkora soils, are much less acid than Elkton and Kinkora soils, and contain more clay in the B horizon than Baile, Fallsington, Leonardtown, and Othello soils. They formed in the same general kind of residuum as the well-drained Legore and Montalto soils and the somewhat poorly drained Kelly soils.

Watchung silt loam, 0 to 3 percent slopes (WaA). This soil has the profile described as representative of the series. Included in mapping are local accumulations of loamy soil material in slight depressions. Some small local areas have been filled or otherwise disturbed.

The soil not only is difficult to drain, but also is difficult to work after drainage. It is sticky when wet and hard when dry. It seldom is used for cultivated crops, although it does not readily deteriorate in use. Permanent hay or permanent improved pasture generally are the most intensive uses in farming. Most areas remain in woodland cover, which produces good habitat for some kinds of wildlife. Capability unit Vw-1; woodland subclass 1w.

Watchung silt loam, 3 to 8 percent slopes (WaB).—This soil has a profile similar to that described as representative of the series, but the surface layer and subsoil are somewhat thinner. Included in mapping are a few acres where the slope is slightly more than 8 percent.

The soil takes up water very slowly, and because it is sloping, most rainfall and snowmelt runs off, creating a moderate hazard of erosion where the soil has been cleared for use. Hay or improved pasture can be produced, but the soil generally is better suited to woodland and wildlife habitat. Capability unit VIw-2; woodland subclass 1w.

Watchung very stony silt loam, 0 to 8 percent slopes (WcB).—This soil has a profile similar to that described as representative of the Watchung series, but it has stones 1 to 2 feet or more in diameter on the surface and in the soil. These stones are no more than 30 feet apart on the average. The stones, in addition to wetness and the difficulty of working the soil, generally prevent adequate preparation of the soil for improved pasture. Included in mapping are a few acres where the slope is slightly more than 8 percent. Use is limited mostly to very limited grazing, woodland, and wildlife habitat. Capability unit VIIs-4; woodland subclass 1w.

Whiteford Series

The Whiteford series consists of well-drained, gently sloping and moderately sloping soils on broad ridgetops at higher elevations than adjacent soils of the Piedmont Plateau. These soils formed in materials weathered in place from black or nearly black, very hard slate. They are moderately deep to deep over slate. The native vegetation is mixed upland hardwoods and Virginia pine.

In a representative profile the surface layer is silt loam about 10 inches thick. It is very dark grayish brown in the upper 1 inch and yellowish brown in the lower 9 inches. The subsoil, about 27 inches thick, is strong-brown and yellowish-red silty clay loam and contains slate fragments. The underlying material, from a depth of 37 inches to 39 inches, is reddish-brown very slaty silt loam. Slate bedrock is at a depth of about 39 inches.

Whiteford soils are easy to work if the moisture content is favorable. A few slate fragments are in the plow layer, and these are abrasive to some farm implements. Whiteford soils are moderately permeable and have high available water capacity. The slope is the chief limitation for both farm and nonfarm uses. Shallowness over bedrock limits some nonfarm uses.

Representative profile of Whiteford silt loam, 3 to 8 percent slopes, in a wooded area at the intersection of Slate Ridge Road and Old Ridge Road, at Whiteford:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable, slightly sticky; many roots; few fine slate fragments; strongly acid; clear, smooth boundary.

A2—1 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; friable, slightly sticky; many roots; few fine slate fragments; very strongly acid; clear, smooth boundary.

B21t—10 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, fine, subangular blocky structure; friable, sticky and slightly plastic; common roots; thin, discontinuous clay films; about 10 percent slate fragments as much as 5 inches in length; very strongly acid; gradual, wavy boundary.

B22t—20 to 37 inches, yellowish-red (5YR 4/6) slaty silty clay loam; moderate and strong, medium, subangular blocky structure; firm, sticky and plastic; few roots; continuous clay films, most prominent on slate fragments; 15 to 25 percent slate fragments as much as 5 inches in length; very strongly acid; gradual, wavy boundary.

C—37 to 39 inches, reddish-brown (5YR 4/4) very slaty silt loam; rock-controlled structure; firm, slightly sticky; few roots; 50 to 75 percent slate fragments, coated; very strongly acid; abrupt, irregular boundary.

R—39 inches, very dark bluish-gray (5B 3/1) (darker than 5B 4/1) to black slate.

The solum ranges from about 24 to 42 inches in thickness. Depth to bedrock ranges from about 3 to 5 feet. Flat fragments of slate, less than 6 inches in length, make up as much as 5 percent of the A horizon, about 5 to 25 percent of the B horizon, and about 40 to 80 percent of the C horizon. A few flagstones of slate occur in places. Unless the soil is limed, reaction is strongly acid or very

strongly acid, and acidity commonly increases with increasing depth.

The A horizon has a hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. Only the A1 horizon, commonly only about 1 inch thick, of an undisturbed profile has a value of 3.

The B horizon has a hue of 7.5YR to 2.5YR and commonly becomes redder with increasing depth. The value is 4 or 5, and the chroma is 4 to 8. This horizon commonly is silty clay loam, but in places is silt loam.

The C horizon has a hue as red or redder than in the B horizon, value of 3 to 5, and chroma of 3 to 6. Fine material in this horizon is loam or silt loam. In most places this horizon is no more than 6 inches thick.

Whiteford soils do not closely resemble any other soils of the Harford County Area. They are most nearly similar to Chester soils, but have a somewhat thinner solum, on the average, and are not so deep over bedrock. They are the only soils of the Harford County Area that formed in, or are significantly influenced by, materials weathered from hard black slate.

Whiteford silt loam, 3 to 8 percent slopes (WhB).—This soil has the profile described as representative of the series. In cultivated areas, however, the plow layer is brown to dark grayish brown. In some areas a small part of their original surface layer has been removed by erosion. Included in mapping are a few areas where slabs or flagstones of hard slate are near the surface.

This soil is well suited to farming. Its only limitation is the moderate hazard of erosion. It can be protected from erosion by fairly simple, easily applied soil-conserving measures. Farming on the contour is effective, particularly if properly installed sodded waterways are used to collect and dispose of surface runoff after exceptionally heavy rains. Between cropping seasons, the surface should be protected by a cover crop or by crop residues left in place. Capability unit IIe-4; woodland subclass 2o.

Whiteford silt loam, 8 to 15 percent slopes, moderately eroded (WhC2).—This soil has a profile similar to that described as representative of the series, but part of the original surface layer has been eroded away in most places. The present surface layer is brown or dark grayish brown and is about 6 to 8 inches thick. Included in mapping are a few shallow gullies and very few deeper gullies, and a few areas where slabs or flagstones of hard slate are near the surface.

The hazard of further erosion is severe if this soil is tilled. Intensive soil-conserving measures are needed. Contour stripcropping, particularly if combined with a suitable crop rotation, is effective in conserving both soil and water. Sodded waterways are needed to intercept and dispose of surface runoff after exceptionally heavy rains. Keeping tillage to a minimum and using cover crops or crop residue to protect the surface between cropping seasons are essential.

This soil is well suited to hay, pasture, and sodded orchards. It is also well suited to woodland, but most areas have been put to more intensive uses. Capability unit IIIe-4; woodland subclass 2o.

Woodstown Series

The Woodstown series consists of deep, moderately well drained, nearly level and gently sloping soils on gently undulating uplands of the Coastal Plain. These soils formed in old marine deposits of sandy sediment containing moderate amounts of silt and clay. The native vegetation is mixed hardwoods that tolerate some wetness, mainly oak and hickory, and some red maple and holly.

In a representative profile the surface layer is dark grayish-brown loam about 9 inches thick. The subsoil, about 25 inches thick, is yellowish-brown friable sandy clay loam that is mottled with grayish brown and strong brown below a depth of about 21 inches. The underlying material to a depth of 60 inches is gray to light-gray, stratified, friable to firm fine sandy loam that is mottled with various shades of brown.

Woodstown soils are easy to work, but seasonal wetness generally delays plowing and planting. These soils are moderately permeable and have moderate available water capacity. They are moderately to severely limited for some nonfarm uses.

Representative profile of Woodstown loam, 0 to 5 percent slopes, in a cultivated area about 2 miles southwest of Aberdeen:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam, approaching sandy loam; moderate, fine and medium, granular structure; friable; many roots; medium acid; clear, smooth boundary.

B21t—9 to 21 inches, yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; many roots; thin, almost continuous clay films; medium acid; gradual, smooth boundary.

B22t—21 to 34 inches, yellowish-brown (10YR 5/4) sandy clay loam; few, coarse, distinct mottles of grayish brown (2.5Y 5/2) and common, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; friable, slightly sticky; common roots; thin, almost continuous clay films; gritty; medium acid; clear, smooth boundary.

Cg—34 to 60 inches, gray to light-gray (5Y 6/1) fine sandy loam; common, medium, distinct mottles of yellowish brown (10YR 5/4) and few, medium, distinct mottles of brown or dark brown (7.5YR 4/4); stratified; friable to firm; very strongly acid.

The solum ranges from about 24 to 40 inches in thickness. Bedrock is at an undetermined great depth. A few fine smooth quartz pebbles occur in places. Unless the soil is limed, reaction is strongly acid to extremely acid, and acidity commonly increases with increasing depth. The solum has a matrix hue of 10YR or 2.5Y.

The A horizon has a value of 4 to 6 and chroma of 1 to 4. Only the A2 horizon, where present, has value of 6 and chroma of 4.

The B horizon has a value of 5 or 6 and chroma of 4 or 6. Mottles are in hue 7.5YR to 2.5Y, value of 5 to 7, and chroma of 1 to 8. Mottles in chroma of 2 or less occur in the lower part of the B horizon, but normally, none are in the upper 10 inches. This horizon is sandy clay loam, loam, sandy loam, or fine sandy loam.

The C horizon has matrix hue of 10YR to 5Y. Matrix value commonly is higher and matrix chroma commonly lower than in the B horizon. Mottling, if any, is similar to that in the B horizon. This horizon ranges from fine sandy loam to sand. In places where this horizon is loamy sand or sand, the transition from the Bt horizon is more than 5 inches. In places the C horizon is stratified with varying textures.

Woodstown soils resemble Delanco, Keyport, and Mattapex soils in color, morphology, and natural drainage, but they contain more sand in the B horizon than any of those soils. They contain less clay in the B horizon than Keyport soils, are more readily permeable and much deeper over bedrock than Delanco soils, and are much less loamy in the solum than Mattapex soils. They formed in the same general kind of marine sediment as the well-drained Sassafras soils and the poorly drained Fallsington soils.

Woodstown loam, 0 to 5 percent slopes (WoB).—Included with this soil in mapping are areas where the slope is slightly more than 5 percent, some moderately eroded spots, and a few areas where the surface or plow layer contains more sand, generally less clay, and less silt than the representative profile described.

The hazard of erosion generally is the most important concern in management of this soil. The more nearly level areas need drainage improvement for some crops, particularly early planted ones. Tile drains function very well in this soil, but ditches can be used. Both require adequate outlets.

Runoff from adjacent higher soils has to be intercepted and diverted. Wherever slope permits, planting on the contour is effective in controlling erosion. Winter cover crops or crop residue are needed to protect the surface between cropping seasons. The soil is suited to many crops, but such perennial crops as alfalfa are subject to frost heaving during winter. Capability unit IIe-16; woodland subclass 2o.

Use and Management of the Soils

Most of the acreage in the Harford County Area is cultivated. General practices of good soil management for cultivated crops and pasture are suggested in the pages that follow. The capability grouping used by Soil Conservation Service is explained, and the capability units in the survey areas are defined. Suggested use and management of each soil in the Area and its classification by capability unit can be found in the mapping unit description of the specified soil in the section "Descriptions of the Soils." Estimated yields of the principle crops grown are shown in table 4.

This part of the survey also contains information on the suitability of the soils for woodland and general suggestions for improvement of wildlife habitat. It reports data from engineering tests and interpretations of soil properties that affect highway construction and other engineering structures. It also contains information on use of the soils for town and country planning.

Farming

Despite rapid urbanization, Harford County ranks among the highest in the State in number of farms. About 133,452 acres in Harford County is used for diversified farming.

Erosion, wetness, and a limited root zone are the major limitations. The paragraphs that follow describe these limitations as they relate to the soils of the Harford County Area.

In addition to the information in this soil survey, knowledge of the latest advances in agricultural research is also important. Current research findings are published regularly in bulletins, fact sheets, and mimeos by the Maryland Agricultural Experiment Station. Unpublished information that is constantly undergoing revision is available upon request from the Harford County agricultural agents and from the Soil Conservation Service soil conservationists assisting the Harford Soil Conservation District.

General principles of soil management

Some general principles of management apply to all the soils suitable for crops and pasture throughout the survey area, although individual soils or groups of soils require different kinds of management.

Most soils in the county require lime, or fertilizer, or both. The amount needed depends on the needs of the crop, the level of yield desired, and on laboratory analyses of the content of lime and plant nutrients in the soil. Only general suggestions for the application of lime and fertilizer are given in this publication; rates are not shown.

Most soils in the Harford County Area were never high in organic-matter content. Returning organic matter by adding farm manure and leaving plant residue on the surface, and by growing sod crops, cover crops, and green-manure crops is important. Increasing the content to a high level by artificial means, however, is not economical.

Tillage breaks down soil structure. It should be kept to the minimum necessary to prepare a seedbed and control weeds. Maintaining the organic-matter content of the plow layer also protects soil structure.

On wet soils, such as Hatboro silt loam, yields of cultivated crops can be increased by open ditch drainage or tile drainage. Tile drains are costly to install, but generally they provide better drainage than open ditches. Soils that have a fragipan are difficult to drain; generally they can be drained better by open ditches than by tile drains. Open ditch drainage is more effective if the ditches intercept the water as it moves horizontally on top of the fragipan. Suitable outlets are needed for drainage through either tile or open ditches.

All the cultivated soils that are gently sloping and steeper are subject to erosion. The hazard of erosion is most severe while crops are growing or after harvesting. On Chester silt loam, 3 to 8 percent slopes, moderately eroded, and other erodible soils, a cropping system that controls runoff and erosion is essential. The cropping system, or sequence of crops grown, should be combined with minimum tillage, mulch planting, use of crop residue, growing cover crops and green-manure crops, and use of lime and fertilizer. Other erosion control practices are contour cultivation, terracing, contour stripcropping (fig. 9), diversion of runoff, and grassed waterways. The effectiveness of a particular combination of these measures differs from one soil to another, but different combinations can be equally effective on the same soil. The local representative of the Soil Conservation Service can assist in planning an effective combination of practices.

Pasture plants help control erosion on all but a few of the soils that are subject to erosion. The high level of pasture management needed on some soils to provide enough ground cover provides for fertilization, control of grazing, selection of pasture mixtures, and other practices that are adequate for maintaining good ground cover and forage. Grazing can be controlled by rotating livestock from one pasture to another and allowing plant regrowth after each grazing period. On some soils, it is important to select pasture mixtures that require the least amount of renovation to maintain good ground cover and forage.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, for forest trees, or for engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These levels are described in the following paragraphs.

Figure 9.—**Stripcropping on Chester and Glenelg soils.**

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can maintain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture or range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIw-7. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers generally are assigned locally, but are a part of a statewide system. Not all the units in the system are represented by the soils in the Harford County Area, so the unit numbers in the Area are not consecutive.

The eight classes of capability classification and the subclasses and units in the Harford County Area are described in the list that follows.

Class I. Soils have few limitations that restrict their use (no subclasses).

Unit I-4. Nearly level, deep, well-drained loams and silt loams that formed in acid sediment or in material weathered from acid and basic rock.

Unit I-6. Nearly level, deep, well-drained silt loams that formed in acid sediment on flood plains.

Class II. Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Subclass IIe. Soils are subject to moderate erosion unless protected.

Unit IIe-4. Gently sloping, deep and moderately deep, well-drained loams, gravelly loams, silt

loams, and gravelly silt loams that formed in acid sediment or in material weathered from acid and basic rock.

Unit IIe-5. Gently sloping, deep, well-drained sandy loams that formed in acid sediment.

Unit IIe-10. Gently sloping, deep, well-drained silt loams that formed in material weathered from basic rock.

Unit IIe-13. Gently sloping, deep, moderately well drained silt loams that have a fragipan or a slowly permeable subsoil layer and formed in acid sediment.

Unit IIe-14. Gently sloping, moderately deep to deep, moderately well drained silt loams that have a fragipan and formed in material weathered from serpentine rock.

Unit IIe-16. Nearly level to gently sloping, deep, moderately well drained to somewhat poorly drained loams and silt loams that formed in acid sediment or in material weathered from acid rock.

Unit IIe-25. Gently sloping, deep, well-drained and somewhat excessively drained loams and channery loams that formed in material weathered from acid micaceous rock.

Subclass IIw. Soils are moderately limited by excess water.

Unit IIw-1. Nearly level, deep, moderately well drained to somewhat poorly drained silt loams that formed in acid sediment or in material weathered from acid rock.

Unit IIw-2. Nearly level, moderately deep to deep, moderately well drained silt loams that have a fragipan and formed in material weathered from serpentine rock.

Unit IIw-7. Nearly level, deep, moderately well drained and somewhat poorly drained silt loams that formed in recent alluvium on flood plains.

Unit IIw-8. Nearly level, deep, moderately well drained silt loams that have a fragipan or a slowly permeable subsoil layer and formed in acid sediment.

Subclass IIs. Soils are moderately limited by droughtiness.

Unit IIs-4. Gently sloping, deep, well-drained and somewhat excessively drained gravelly sandy loams that formed in acid sandy sediment.

Unit IIs-7. Gently sloping, deep, well-drained silt loams that formed in acid loamy sediment.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Subclass IIIe. Soils subject to severe erosion if cultivated and not protected.

Unit IIIe-4. Moderately sloping, deep and moderately deep, well-drained loams, gravelly loams, silt loams, and gravelly silt loams that formed in acid sediment or in material weathered from acid and basic rock.

Unit IIIe-5. Moderately sloping, deep, well-drained sandy loams that formed in acid sediment.

Unit IIIe-7. Moderately sloping, deep, well-drained silt loams that formed in acid loamy sediment.

Unit IIIe-10. Moderately sloping, deep, well-drained to excessively drained loams, gravelly loams, and silt loams that formed in material weathered from acid and basic rock.

Unit IIIe-13. Moderately sloping, deep, moderately well drained silt loams that have a fragipan and formed in acid sediment.

Unit IIIe-14. Moderately sloping, moderately deep to deep, moderately well drained silt loams that have a fragipan and formed in material weathered from serpentine rock.

Unit IIIe-25. Moderately sloping, deep, well-drained to somewhat excessively drained loams and channery loams that formed in material weathered from acid micaceous rock.

Unit IIIe-33. Moderately sloping, deep, well-drained to excessively drained gravelly sandy loams that formed in acid sediment.

Unit IIIe-42. Nearly level to gently sloping areas of loamy and clayey land that formed in acid clayey sediment.

Subclass IIIw. Soils are severely limited by excess water.

Unit IIIw-7. Nearly level, deep, poorly drained loams and silt loams that formed in acid sediment.

Unit IIIw-9. Nearly level, deep, poorly drained loams that formed in old clayey marine sediment.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Subclass IVe. Soils are subject to very severe erosion if they are cultivated and not protected.

Unit IVe-3. Moderately sloping to strongly sloping, deep, well-drained loams, gravelly loams, and gravelly silt loams that formed in material weathered from acid rock.

Unit IVe-5. Moderately sloping, deep, well-drained to excessively drained soils of variable textures that formed in acid sandy and gravelly sediment.

Unit IVe-10. Moderately sloping and strongly sloping, deep, well-drained silt loams and silty clay loams that formed in material weathered from basic rock.

Unit IVe-25. Moderately sloping and strongly sloping, deep, well-drained to somewhat excessively drained loams and channery loams that formed in material weathered from acid micaceous rock.

Subclass IVw. Soils are limited by excess wetness.

Unit IVw-3. Gently sloping to moderately sloping, deep, poorly drained and somewhat poorly drained silt loams that formed in material weathered from basic rock or in old, acid silty sediment.

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass Vw. Soils are too wet for cultivation; drainage generally is not feasible.

Unit Vw-1. Nearly level, deep, poorly drained silt loams that formed in material weathered from acid and basic rock or in old alluvial sediment.

Class VI. Soils have severe limitations that make them generally unsuitable for cultivation and that limit their

use largely to pasture, woodland, or wildlife food and cover.

Subclass VIe. Soils are severely limited, chiefly by hazard of erosion, unless protective cover is maintained.

Unit VIe-2. Moderately sloping to steep, deep soils and loamy and clayey land that formed in material weathered from acid micaceous rock or in acid, sandy, gravelly, and clayey sediment.

Unit VIe-3. Strongly sloping to steep, deep, well-drained and somewhat excessively drained soils of variable texture that formed in material weathered from acid and basic rock.

Subclass VIw. Soils are severely limited by excess water and generally are unsuitable for cultivation.

Unit VIw-1. Alluvial land subject to frequent flooding.

Unit VIw-2. Gently sloping, deep, poorly drained silt loams that formed in material weathered from acid and basic rock or in acid sediment

Subclass VIs. Soils generally are unsuitable for cultivation and limited for other uses by available moisture capacity, stones, or other features.

Unit VIs-3. Nearly level to strongly sloping, moderately deep to deep, moderately well drained to somewhat excessively drained stony soils that formed in material weathered from acid and basic rock.

Class VII. Soils have very severe limitations that make them unsuitable for cultivation without major reclamation and that restrict their use largely to grazing, woodland, or wildlife habitat.

Subclass VIIe. Soils are very severely limited, chiefly by hazard of erosion, unless protective cover is maintained.

Unit VIIe-2. Loamy and clayey land that is strongly sloping to steep.

Unit VIIe-3. Steep, deep, somewhat excessively drained gravelly loams that formed in material weathered from acid rock.

Subclass VIIw. Soils are very severely limited by excess water.

Unit VIIw-1. Swamp areas that are mostly heavily wooded.

Subclass VIIs. Soils are very severely limited by available water capacity, stones, or other soil features.

Unit VIIs-3. Steep, deep, well-drained to excessively drained stony soils that formed in material weathered from acid and basic rock.

Unit VIIs-4. Nearly level to strongly sloping, deep, poorly drained and somewhat poorly drained stony soils that formed in material weathered from basic rock.

Unit VIIs-32. Strongly sloping to steep, shallow to moderately deep, well-drained channery silty clay loams that formed in material weathered from serpentine rock.

Class VIII. Soils and landforms that, without major reclamation, have limitations that preclude their use for commercial crops and restrict their use to recreation, wildlife habitat, water supply, or to esthetic purposes.

Subclass VIIIw. Extremely wet marshy land.

Unit VIIIw-1. Tidal marsh.

Subclass VIIIs. Stony land and miscellaneous areas that have little potential for commercial production of vegetation.

Unit VIIIs-1. Stony land, steep.

Unit VIIIs-4. Sand and gravel pits.

Estimated yields

Table 4 shows estimates of the yields of principal crops for each arable soil in the Harford County Area. Only the soils used for crops are listed. The estimates are averages that can be obtained over a period of years under the best current management practices and a wide range of rainfall and other climatic conditions. Improved management practices are—

1. Liming, on the basis of reliable soil tests, to keep the pH value of the soil consistent with the need of the crop.
2. Applying fertilizer, in amounts based on soil tests, to insure maximum yields.
3. Adequately controlling weeds, insects, and diseases by the most advanced chemical and cultural methods.
4. Using certified seed of an advanced and reliable variety that has been treated for fungus and disease control, and seeding at rates designed to produce maximum yields.
5. Managing fieldwork by limiting the number of trips over a field to those absolutely essential to produce a crop, by tilling at the proper soil moisture content to prevent compaction of moist soil, and by using crop residue to improve tilth and moisture-retaining properties.
6. Using rotations and cover crops to control weeds, improve moisture-retaining properties and tilth of the soil, help control diseases, lessen effects of erosion, and maintain organic-matter content.
7. Farming on the contour, stripcropping, and installing diversion terraces and grassed waterways to help control erosion, prevent runoff of usable water, and increase moisture retention in the soil.
8. Adequately draining wet soils to prevent crop flooding, allow better aeration, and lower the water table to a depth that does not hinder crop growth.

The estimates for yields listed are averages, not maximum possible yields. Many soils in the area are capable of producing more than 150 bushels of corn per acre in a given year. Yields vary on the same soil from year to year depending on management, weather, insects and diseases, and other factors. Yields listed in table 4 indicate a practical production level over a number of years under varying conditions, using better than average management.

As farm technology advances, crop yields on soils of the area should show an upward trend. Yields listed in table 4 reflect the status of technology in the early 1970's. Adjustments upward should be made in succeeding years to keep abreast of current technology. Yield differences among different soils should remain the same.

Yield estimates were arrived at jointly by agronomists and soil scientists of the University of Maryland and the Soil Conservation Service. Data for estimating yields were based on numerous sources of crop and soil research, U.S. Bureau of Census reports, and market records and miscellaneous publications issued by the Department of Agricultural Economics, University of Maryland, Agricultural Experiment Station.

TABLE 4.—*Estimated average yield per acre of specified crops on arable soils under improved management*

[Absence of a figure indicates crop is not suited to the soil specified or is not commonly grown on it]

Soil	Corn		Oats	Wheat	Soybeans	Hay		Pasture	
	Grain	Silage				Alfalfa and grass	Tall grass and clover	Bluegrass	Tall grass
	Bu	*Tons*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Aldino silt loam, 0 to 3 percent slopes	105	21	65	45		3.5	3.0	135	200
Aldino silt loam, 3 to 8 percent slopes	105	21	65	45		3.5	3.0	135	200
Aldino silt loam, 8 to 15 percent slopes	100	20	60	40		3.5	3.0	135	200
Aldino very stony silt loam, 0 to 8 percent slopes								110	
Baile silt loam, 0 to 3 percent slopes							2.0		115
Baile silt loam, 3 to 8 percent slopes							2.0		115
Beltsville silt loam, 0 to 2 percent slopes	95	19		45	35		3.0		170
Beltsville silt loam, 2 to 5 percent slopes	95	19		45	35		3.0		170
Beltsville silt loam, 5 to 10 percent slopes	80	18		40	30		3.0		170
Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded	75	15	55	35		3.0	2.5	115	170
Brandywine gravelly loam, 15 to 25 percent slopes, severely eroded								80	
Brandywine gravelly loam, 25 to 45 percent slopes, severely eroded								80	
Chester silt loam, 0 to 3 percent slopes	135	27	80	50	45	5.5	3.5	160	315
Chester silt loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Chester silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.5	3.5	160	285
Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.5	3.5	160	285
Chester gravelly silt loam, 15 to 25 percent slopes, moderately eroded	110	22	65	40		4.5	3.0	135	255
Chillum silt loam, 2 to 5 percent slopes, moderately eroded	130	26		50	45	5.0	3.5		285
Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded	120	24		45	40	4.5	3.5		255
Codorus silt loam	130	26	80	45	45	4.5	3.5	160	255
Comus silt loam	140	28	80	50	45	5.5	3.5	160	315
Delanco silt loam, 0 to 3 percent slopes	120	24	75	45	35	4.5	3.5	160	285
Delanco silt loam, 3 to 8 percent slopes	120	24	75	45	35	4.5	3.5	160	285
Elioak silt loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Elioak silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.0	3.5	160	285
Elkton silt loam	105	21			40		3.5		200
Elsinboro loam, 0 to 2 percent slopes	130	26	80	50	45	5.0	3.5	160	285
Elsinboro loam, 2 to 5 percent slopes, moderately eroded	130	26	80	50	45	5.0	3.5	160	285
Elsinboro loam, 5 to 10 percent slopes, moderately eroded	120	24	75	45	35	4.5	3.5	160	255
Evesboro loamy sand, 5 to 15 percent slopes									120
Fallsington loam	120	24			35		3.0		170
Glenelg loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Glenelg loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45		5.0	3.5	160	285
Glenelg loam, 8 to 15 percent slopes, severely eroded	110	22	65	40		4.5	3.0	135	255
Glenelg loam, 15 to 25 percent slopes, moderately eroded	110	22	65	40		4.5	3.0	135	255
Glenelg loam, 15 to 25 percent slopes, severely eroded								115	
Glenelg gravelly loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45		5.0	3.5	160	285
Glenelg gravelly loam, 8 to 15 percent slopes, severely eroded	110	22	65	40		4.5	3.0	135	255

See footnote at end of table.

TABLE 4.—*Estimated average yield per acre of specified crops on arable soils under improved management*—Continued

Soil	Corn		Oats	Wheat	Soybeans	Hay		Pasture	
	Grain	Silage				Alfalfa and grass	Tall grass and clover	Bluegrass	Tall grass
	Bu	*Tons*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	110	22	65	40		4.5	3.0	135	255
Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded								115	
Glenville silt loam, 0 to 3 percent slopes	100	20	65	40	35	3.5	3.0	135	200
Glenville silt loam, 3 to 8 percent slopes	100	20	65	40	35	3.5	3.0	135	200
Hatboro silt loam	115	23					3.5		200
Joppa gravelly sandy loam, 2 to 5 percent slopes	100	20		45	35	3.5	3.0		200
Joppa gravelly sandy loam, 5 to 10 percent slopes	90	18		40	30	3.0	2.5		170
Kelly silt loam, 3 to 8 percent slopes	70	14	50				2.5	115	145
Kelly silt loam, 8 to 15 percent slopes, moderately eroded	60	12	50				2.0	90	115
Keyport silt loam, 0 to 2 percent slopes	110	22		40	40		3.0		170
Keyport silt loam, 2 to 5 percent slopes	110	22		40	40		3.0		170
Kinkora silt loam, 0 to 3 percent slopes	105	21			40		3.5		200
Kinkora silt loam, 3 to 8 percent slopes	105	21			40		3.5		200
Legore silt loam, 3 to 8 percent slopes, moderately eroded	95	19	65	40		3.5	3.0	135	200
Legore silt loam, 8 to 15 percent slopes, moderately eroded	90	18	60	35		3.0	2.5	115	170
Legore silt loam, 15 to 25 percent slopes, moderately eroded	80	16	55	30		3.0	2.0	90	170
Legore silt loam, 25 to 45 percent slopes								80	
Legore very stony silt loam, 0 to 15 percent slopes								90	
Legore very stony silt loam, 15 to 25 percent slopes								70	
Legore silty clay loam, 8 to 15 percent slopes, severely eroded	80	16	55	30		3.0	2.0	90	170
Legore silty clay loam, 15 to 25 percent slopes, severely eroded								80	
Leonardtown silt loam	70	14			25		2.5		145
Loamy and clayey land, 0 to 5 percent slopes	85	17		35	30	3.5	3.0		200
Manor loam, 3 to 8 percent slopes, moderately eroded	95	19	65	40		3.5	3.0	135	200
Manor loam, 8 to 15 percent slopes, moderately eroded	90	18	60	35		3.0	2.5	115	170
Manor loam, 8 to 15 percent slopes, severely eroded	80	16	55	30		3.0	2.0	90	170
Manor loam, 15 to 25 percent slopes, moderately eroded	80	16	55	30		3.0	2.0	90	170
Manor loam, 15 to 25 percent slopes, severely eroded								80	
Manor channery loam, 3 to 8 percent slopes, moderately eroded	95	19	65	40		3.5	3.0	135	200
Manor channery loam, 8 to 15 percent slopes, moderately eroded	90	18	60	35		3.0	2.5	115	170
Manor channery loam, 8 to 15 percent slopes, severely eroded	80	16	55	30		3.0	2.0	90	170
Manor channery loam, 15 to 25 percent slopes, moderately eroded	80	16	55	30		3.0	2.0	90	170
Manor channery loam, 15 to 25 percent slopes, severely eroded								80	
Manor very stony loam, 25 to 45 percent slopes								80	
Manor soils, 25 to 45 percent slopes								80	
Manor and Glenelg very stony loams, 3 to 15 percent slopes								90	
Manor and Glenelg very stony loams, 15 to 25 percent slopes								70	
Matapeake silt loam, 0 to 2 percent slopes	140	28		50	45	5.5	3.5		315
Matapeake silt loam, 2 to 5 percent slopes	140	28		50	45	5.5	3.5		315

See footnote at end of table.

TABLE 4.—*Estimated average yield per acre of specified crops on arable soils under improved management*—Continued

Soil	Corn		Oats	Wheat	Soybeans	Hay		Pasture	
	Grain	Silage				Alfalfa and grass	Tall grass and clover	Bluegrass	Tall grass
	Bu	*Tons*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Mattapex silt loam, 0 to 2 percent slopes	135	27	------	45	45	4.5	3.5	----------	255
Mattapex silt loam, 2 to 5 percent slopes	135	27	------	45	45	4.5	3.5	----------	255
Montalto silt loam, 0 to 3 percent slopes	135	27	80	50	45	5.5	3.5	160	315
Montalto silt loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Montalto silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.0	3.5	160	285
Neshaminy silt loam, 0 to 3 percent slopes	135	27	80	50	45	5.5	3.5	160	315
Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	135	27	80	50	45	5.5	3.5	160	315
Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.0	3.5	160	285
Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes	------	------	------	------	----------	----------	----------	90	----------
Neshaminy and Montalto very stony silt loams, 15 to 25 percent slopes	------	------	------	------	----------	----------	----------	70	----------
Othello silt loam	115	23	------	------	40	----------	3.5	----------	200
Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	130	26	------	50	45	5.5	3.5	----------	315
Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	120	24	------	45	40	5.0	3.5	----------	285
Sassafras loam, 2 to 5 percent slopes, moderately eroded	130	26	------	50	45	5.5	3.5	----------	315
Sassafras loam, 5 to 10 percent slopes, moderately eroded	120	24	------	45	40	5.5	3.5	----------	315
Sassafras and Joppa soils, 10 to 15 percent slopes	80	16	------	35	----------	3.0	2.5	----------	230
Watchung silt loam, 0 to 3 percent slopes	------	------	------	------	----------	----------	2.0	----------	115
Watchung silt loam, 3 to 8 percent slopes	------	------	------	------	----------	----------	2.0	----------	115
Whiteford silt loam, 3 to 8 percent slopes	135	27	80	50	45	5.5	3.5	160	315
Whiteford silt loam, 8 to 15 percent slopes, moderately eroded	125	25	75	45	35	5.5	3.5	160	285
Woodstown loam, 0 to 5 percent slopes	130	26	------	40	40	4.5	3.5	----------	255

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of days the pasture can be grazed during a single season without injury to the sod. An acre of pasture that provides 100 days of grazing for two cows, for example, has a carrying capacity of 200 cow-acre-days.

Woodland

According to the Conservation Needs Inventory, about 115,000 acres of Harford County was woodland in 1970. Further reduction in the woodland acreage, as a result of urban and suburban expansion, is expected.

At the present time, forested land has about one-third greater market value, per acre, than farm land or idle land for residential development. The increasing esthetic value also is removing woodland from wood crop production (fig. 10).

The trees of the Harford County Area are of three general forest types. The Coastal Plain part of the survey area is dominated by red oak, willow oak, sweetgum, some artificial stands of loblolly and white pine, and an understory of holly.

In the northern part of the survey area, on the soils formed mostly in residuum from mica schist, Chester, Glenelg, Elioak, and Manor soils, for example, forests are dominantly of oak and hickory. Between the northern part and the Coastal Plain, forests are dominantly yellow-poplar and oak.

Some forested areas in the county are unique. Eastern hemlock grows along some of the larger stream valleys, and northern sweet birch has invaded a few valleys. Soils that are only moderately deep over serpentine rock, Chrome soils, for example, support poor stands of blackjack oak, post oak, and Virginia pine.

Management of woodland

Table 5 lists all the soils of the survey area that are suited to wood crops and lists those factors that affect woodland management. It shows the woodland class and subclass of each soil and the estimated site index for oaks and other suitable species. It identifies the species that should be favored in existing stands and those suitable for planting.

In table 5, each woodland suitability group in the county is rated for various management hazards or limitations. The hazards and limitations are expressed as *slight, moderate,* and *severe.* They are described in the following paragraphs.

Figure 10.—**Small sawmill south of Bel Air uses timber from a 40-mile radius.**

Equipment limitations depend on soil characteristics that restrict or prohibit the use of harvesting equipment, either seasonally or continually. A *slight* limitation indicates no restrictions in the kind of equipment or time of year it is used; *moderate* means that use of equipment is restricted for 3 months of the year or less; *severe* means that special equipment is needed and that its use is severely restricted for more than 3 months of the year.

Seedling mortality refers to mortality of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions. Competing vegetation is not considered. *Slight* indicates a loss of 0 to 25 percent, *moderate* a loss of 25 to 50 percent, and *severe* a loss of more than 50 percent of the seedlings. Seed supplies are assumed to be adequate.

Plant competition is the degree to which undesirable plants invade openings in the tree canopy. Considered in the ratings are available water capacity, fertility, drainage, and degree of erosion. Conifers and hardwoods are rated separately in table 5. A rating of *slight* means that plant competition does not prevent adequate natural regeneration and early growth or interfere with seedling development. *Moderate* means that competition delays natural or artificial establishment and growth rate, but does not prevent the development of fully stocked normal stands. *Severe* means that competition prevents adequate natural or artificial regeneration unless the site is prepared properly and maintenance practices, such as burning, spraying, disking, or girdling, are used.

Erosion hazard refers to the soil erosion that occurs following the cutting if the soil is exposed along roads, skid trails, fire lanes, and log decking areas. The degree of hazard varies with slope and also with the erodibility of the particular kind of soil. A rating of *slight* means that little or none of the original surface soil will erode when the soil is exposed. *Moderate* means that as much as 25 to 75 percent of the original surface soil could erode if the soil is exposed. *Severe* means that, if the soil is exposed, all or practically all of the original surface soil could be removed by erosion.

Windthrow hazard depends on the soil characteristics that enable trees to resist being blown down by wind. A rating of *slight* means that most trees withstand the wind; *moderate* means that some trees are expected to blow down during excessive wetness and high wind; *severe* means that many trees are expected to blow down during periods when the soil is wet and winds are moderate or high.

Table 5 lists the species to be favored in existing stands and the suitable species for planting. The estimated site index in table 5 is the height, in feet, that the tallest trees reach at 50 years of age on the soils of each group.

Woodland classes and subclasses

The soils of the Harford County Area have been evaluated and grouped according to a nationwide system put into effect by woodland conservationists of the Soil Conservation Service. In this system, known as ordination, soils are assigned to woodland classes according to their potential productivity for tree species and to subclasses according to their inherent limitations, if any, for woodland management.

Potential productivity is expressed as site index, which is the height, in feet, that a specified tree growing on that soil is expected to reach in 50 years.

The woodland classification of the soils of the Harford County Area is based mainly on the site index classes for commercial species of oaks, specifically red oak, black oak, white oak, and pin oak. The classification also is based in part on the site index classes for loblolly pine, Virginia pine, and yellow-poplar. No natural stands of loblolly pine exist in the Harford County Area, but this species is abundant in nearby parts of Maryland, Delaware, and Virginia, growing on the same kinds of soil, particularly those on the Coastal Plain. Loblolly pine is a good commercial tree for planting, and one that grows well for reasonable distances outside its habitat. The determinations of site indices of all indexed species were made in Maryland and in parts of Pennsylvania, Delaware, New Jersey, and Virginia.

On the basis of their relative productivity for Virginia pine and mixed oaks, the soils of the Harford County Area have been assigned to five classes: class 1, soils of very high productivity, site index greater than 85; class 2, soils of high productivity, site index 75 to 85; class 3, soils of medium productivity, site index 65 to 75; class 4, soils of low productivity, site index 55 to 65; and class 5, soils of very low productivity, site index 45 to 55. Site index ranges of the productivity classes are 10 feet higher for loblolly pine and yellow-poplar.

Site index can be converted into approximate expected growth and yield per acre in cords and board feet. For the Harford County Area, conversions of average site index into volumetric growth and yield are based on research of upland oaks (*7*), loblolly pine (*8*), yellow-poplar (*3*), and Virginia pine (*6*).

The soils of the Harford County Area are assigned to seven subclasses, identified as follows: subclass *x*, limited by extreme stoniness; subclass *w*, limited by wetness or a high water table; subclass *c*, limited by the kind or amount of clay at or within a few inches of the soil surface; subclass *s*, limited by excessive sandiness; subclass *f*, limited by large amounts of coarse fragments, smaller than stones, in the soil profile; subclass *r*, limited by relief or steep slopes; and subclass *o*, no limitations.

The names of the soil series represented are given in each woodland subclass description, but the listing of the series name does not necessarily indicate that all the soils of a series are in the same woodland subclass. The woodland subclass of individual soils is shown at the end of each mapping unit description and in the "Guide to Mapping Units." Descriptions of the 15 woodland subclasses in the Harford County Area follow.

WOODLAND SUBCLASS 1o

This woodland subclass consists of the nearly level well-drained soils of the Comus series. These soils are highly productive and are not significantly restricted or limited for woodland use or management.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 370 board feet of timber; yellow-poplar, 640 board feet of timber; loblolly pine, 900 board feet of timber or 1.5 cords of pulpwood; and Virginia pine, 3.0 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 90 cords per acre of pulpwood, and at 50 years of age, a fully stocked stand yields about 150 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 18,500 board feet of timber; yellow-poplar, 32,000 board feet of timber; and loblolly pine, 27,000 board feet of timber or 77 cords of pulpwood.

The soils of this subclass are excellent for the production of black walnut, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 1w

This woodland subclass consists of nearly level to gently sloping soils of the Baile, Codorus, Kinkora, and Watchung series. These soils are highly productive, but are moderately to severely limited for use of heavy equipment by seasonal wetness, a high water table, or flooding. Wetness causes severe seedling mortality on some of the soils, and also causes severe plant competition for woodland species. Flooding is a hazard on Codorus soils.

All of these soils are well suited to oaks. Baile and Watchung soils are particularly well suited to pin oak. In a normal stand 50 years of age, the average annual growth per acre for oaks is about 370 board feet of timber, and the average yield per acre is about 18,500 board feet of timber.

Codorus soils are particularly well suited to yellow-poplar. In a normal stand 50 years of age, the average annual growth per acre is about 640 board feet of timber, and the average yield per acre is about 32,000 board feet of timber.

Many of these soils support good natural stands of red maple, but no reliable estimates of yields have been determined.

WOODLAND SUBCLASS 2o

This woodland subclass consists of well drained to somewhat excessively drained, well drained, or moderately well drained soils of the Chester, Delanco, Elsinboro, Glenelg, Legore, Manor, Neshaminy, Whiteford, and Woodstown series. The soils are highly productive and have no major limitations to woodland management. The slope is as much as 15 percent.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 275 board feet of timber; yellow-poplar, 490 board feet of timber; loblolly pine, 680 board feet of timber or 1.3 cords of pulpwood; and Virginia pine, 1.9 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 57 cords of pulpwood per acre, and at 50 years of age, a fully stocked stand yields about 95 cords per acre.

In a normal stand 50 years of age, the average yield per acre on these soils is as follows: mixed oaks, 13,750 board feet of timber; yellow-poplar, 24,400 board feet of timber; and loblolly pine, 18,800 board feet of timber or 63 cords of pulpwood.

The Chester, Glenelg, Legore, and Neshaminy soils of this subclass are good for the production of black walnut, but no

TABLE 5.—*Wood crops and*

[Absence of entry means information was not available.

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Competition for—		Erosion hazard
				Conifers	Hardwoods	
Aldino: AdA, AdB, AsB	3o	Slight	Slight	Moderate	Slight	Slight
AdC	3r	Slight	Slight	Moderate	Slight	Moderate
Alluvial land: Av	2w	Severe: high water table; flooding.	Moderate	Severe	Moderate	Slight
Baile: BaA, BaB	1w	Severe: high water table.	Severe	Severe	Severe	Slight
Beltsville: BeA, BeB, BeC	3w	Moderate: perched water table.	Moderate	Moderate	Slight	Slight
Brandywine: BrC2	3f	Slight	Moderate	Moderate	Slight	Slight
BrD3	3f	Moderate: slope	Moderate	Moderate	Slight	Slight
BrE3	3f	Severe: slope	Moderate	Moderate	Slight	Moderate
Chester: CcA, CcB2, CcC2, CgB2, CgC2	2o	Slight	Slight	Severe	Moderate	Slight
CgD2	2r	Moderate	Slight	Severe	Moderate	Moderate
Chillum: ChB2, CkC2. For Neshaminy part of CkC2, see Neshaminy series.	3o	Slight	Slight	Moderate	Slight	Slight
Chrome: CrE	4c	Moderate to severe: plastic subsoil, slope.	Slight	Slight	Slight	Moderate to severe.
Codorus: Cu	1w	Moderate: seasonal high water table; flooding.	Slight	Severe	Severe	Slight
Comus: Cv	1o	Slight	Slight	Severe	Severe	Slight
Cut and fill land: Cx. Unsuited to wood crops. Too variable to be rated.						
Delanco: DcA, DcB	2o	Slight	Slight	Severe	Moderate	Slight
Elioak: EhB2, EhC2	2c	Moderate: plastic subsoil.	Slight	Severe	Moderate	Slight

factors in management

Symbol > means greater than, < means less than]

Windthrow hazard	Site index range				Preferred species		
	Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	For planting	For Christmas trees
Slight	65–75		70–80		Red oak, yellow-poplar, ash.	White pine, Virginia pine, Norway spruce.	Scotch pine, white pine, Norway spruce.
Slight	65–75		70–80		Red oak, yellow-poplar, ash.	White pine, Virginia pine, Norway spruce.	Scotch pine, white pine, Norway spruce.
Slight		85–95			Sweetgum, red maple, mixed oaks.	Loblolly pine, white pine, sweetgum.	Scotch pine, white pine.
Slight	85–95				Pin oak, other oaks, red maple.	White pine, Norway spruce, white spruce.	Scotch pine, white pine, Norway spruce.
Slight	60–75	65–75		65–75	Virginia pine, loblolly pine, red oak.	Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
Slight	65–75		70–80	65–75	Red oak, shortleaf pine, yellow-poplar, Virginia pine.	Loblolly pine, white pine, larch.	Scotch pine, white pine, Norway spruce.
Slight	65–75		70–80	65–75	Red oak, shortleaf pine, yellow-poplar, Virginia pine.	Loblolly pine, white pine, larch.	Scotch pine, white pine, Norway spruce.
Slight	65–75		70–80	65–75	Red oak, shortleaf pine, yellow-poplar, Virginia pine.	Loblolly pine, white pine, larch.	Scotch pine, white pine, Norway spruce.
Slight	75–85		77–89	75–85	Upland oaks, yellow-poplar, ash, black walnut, shortleaf pine, Virginia pine.	Black walnut, yellow-poplar, white pine, loblolly pine, larch.	Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce.
Slight	75–85		77–89	75–85	Upland oaks, yellow-poplar, ash, black walnut, shortleaf pine, Virginia pine.	Black walnut, yellow-poplar, white pine, loblolly pine, larch.	Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce.
Slight	65–75		75–85	65–75	Red oak, Virginia pine, yellow pine.	White pine, loblolly pine, Virginia pine, yellow-poplar.	Scotch pine, Norway pine, Austrian pine, white pine.
Slight	55–65			55–65	Red oak, Virginia pine.	None	None.
Slight	>85		>95		Red oak, red maple, yellow-poplar, ash.	White pine, yellow-poplar.	Douglas fir, Scotch pine, Norway spruce, white pine, Austrian pine.
Slight	85		95		Red oak, black walnut, yellow-poplar, ash.	White pine, black walnut, yellow-poplar.	Douglas fir, Scotch pine, Norway spruce, Austrian pine, white pine.
Slight	75–85		85–95		Red oak, yellow-poplar, red maple.	White pine, yellow-poplar.	Scotch pine, white pine.
Slight	75–85		85–95	70–80	Upland oaks, black walnut, yellow-poplar, shortleaf pine, Virginia pine.	Black walnut, yellow-poplar, white pine, loblolly pine.	Scotch pine, Norway spruce, Austrian pine.

TABLE 5.—*Wood crops and*

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Competition for—		Erosion hazard
				Conifers	Hardwoods	
Elkton: En	3w	Severe: high water table.	Slight	Severe	Severe	Slight
Elsinboro: EsA, EsB2, EsC2	2o	Slight	Slight	Severe	Moderate	Slight
Evesboro: EvC	3s	Moderate: loose sand	Moderate	Moderate	Slight	Slight
Fallsington: Fs	2w	Severe: high water table.	Severe	Severe	Severe	Slight
Glenelg: GcB2, GcC2, GcC3, GgB2, GgC2, GgC3.	2o	Slight	Slight	Severe	Moderate	Slight
GcD2; GcD3; GgD2, GgD3	2r	Moderate: slope	Slight	Severe	Moderate	Moderate
Glenville: GnA, GnB	2w	Moderate: perched water table.	Slight	Severe	Moderate	Slight
Hatboro: Hb	3w	Severe: high water table; flooding.	Slight	Moderate	Slight	Slight
Joppa: JpB, JpC	3f	Slight	Moderate	Moderate	Slight	Slight
Kelly: KeB	4w	Severe: high water table; plastic subsoil.	Moderate	Severe	Moderate	Slight
KeC2	4w	Severe: high water table; plastic subsoil.	Moderate	Severe	Moderate	Moderate
KfD	4w	Severe: high water table; plastic subsoil.	Moderate	Severe	Moderate	Severe
Keyport: KpA, KpB	3w	Moderate: seasonal high water table.	Slight	Moderate	Slight	Slight
Kinkora: KrA, KrB	1w	Severe: high water table; plastic subsoil.	Severe	Severe	Severe	Slight
Legore: LeB2, LeC2, LfC, LgC3	2o	Slight	Slight	Severe	Moderate	Slight
LeD2, LeE, LfD, LfE, LgD3	2r	Moderate to severe: slope.	Slight	Severe	Moderate	Slight to moderate.
Leonardtown: Lr	3w	Severe: high perched water table.	Severe	Severe	Severe	Slight

factors in management—Continued

Windthrow hazard	Site index range				Preferred species		
	Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	For planting	For Christmas trees
Slight	65–75	75–85			Lowland oaks, loblolly pine, sweetgum, red maple.	Loblolly pine, white pine, sweetgum.	Scotch pine, white pine.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, Virginia pine, ash.	White pine, yellow-poplar, loblolly pine.	Scotch pine, white pine, Austrian pine, Norway spruce, blue spruce.
Slight	65–75	75–85		65–75	Red oak, Virginia pine, shortleaf pine, loblolly pine.	Loblolly pine, shortleaf pine, Virginia pine.	Scotch pine, white pine.
Slight	75–85	75–90			Red oak, red maple, sycamore, sweetgum, loblolly pine, yellow-poplar.	Loblolly pine, white pine, sweetgum, yellow-poplar.	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	60–80	Red oak, black walnut, yellow-poplar, shortleaf pine, Virginia pine.	White pine, black walnut, yellow-poplar, loblolly pine, Virginia pine, larch.	Scotch pine, white pine, Austrian pine, Norway spruce, blue spruce.
Slight	75–85		85–95	60–80	Red oak, black walnut, yellow-poplar, shortleaf pine, Virginia pine.	White pine, black walnut, yellow-poplar, loblolly pine, Virginia pine, larch.	Scotch pine, white pine, Austrian pine, Norway spruce, blue spruce.
Slight	75–85		85–95	70–80	Red oak, red maple, yellow-poplar, ash, sweetgum, Virginia pine.	White pine, loblolly pine, yellow-poplar.	Scotch pine, white pine, Austrian pine, Norway spruce.
Slight	65–75				Pin oak, other oaks, sycamore, sweetgum.	Sweetgum, sycamore, white pine.	Scotch pine, white pine, Norway spruce.
Slight	65–75			65–75	Red oak, Virginia pine, shortleaf pine.	Loblolly pine, Virginia pine, shortleaf pine.	Scotch pine, white pine.
Moderate	55–65			55–65	Black oak, redcedar, shortleaf pine, Virginia pine.	Virginia pine	Scotch pine, white pine, Virginia pine.
Moderate	55–65			55–65	Black oak, redcedar, shortleaf pine, Virginia pine.	Virginia pine	Scotch pine, white pine, Virginia pine.
Moderate	55–65			55–65	Black oak, redcedar, shortleaf pine, Virginia pine.	Virginia pine	Scotch pine, white pine, Virginia pine.
Slight	65–75	65–75		65–75	Red oak, sweetgum, loblolly pine, Virginia pine.	Larch, sweetgum, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine.
Slight	85				Pin oak, red maple, sycamore.	White pine, spruce	Scotch pine, white pine.
Slight	70–75		80–95	70–85	Red oak, black walnut, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine, Norway spruce, blue spruce.
Slight	70–85		80–95	70–85	Red oak, black walnut, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, Virginia pine, loblolly pine, white pine.	Scotch pine, Austrian pine, white pine, Norway spruce, blue spruce.
Moderate		75–85			Loblolly pine, red maple, sweetgum.	Loblolly pine	Scotch pine, Norway spruce.

TABLE 5.—*Wood crops and*

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Competition for—		Erosion hazard
				Conifers	Hardwoods	
Loamy and clayey land:						
LyB	3c	Moderate: plastic subsoil.	Slight	Moderate	Slight	Slight
LyD	3c	Moderate: plastic subsoil.	Slight	Moderate	Slight	Moderate
LyE	3c	Moderate: plastic subsoil; slope.	Slight	Moderate	Slight	Severe
Manor:						
MbB2, McB2	2o	Slight	Slight to moderate.	Severe	Moderate	Slight
MbC2, MbC3, McC2, McC3	2r	Slight	Slight to moderate.	Severe	Moderate	Moderate
MbD2, MbD3, McD2, McD3	2r	Moderate: slope	Slight to moderate.	Severe	Moderate	Severe
MdE, MfE	2r	Moderate to severe: slope.	Slight to moderate.	Severe	Moderate	Severe
MgC	2r	Slight	Slight to moderate.	Severe	Moderate	Moderate
MgD For Glenelg part of MgC and MgD, see Glenelg series.	2r	Moderate: slope	Slight to moderate.	Severe	Moderate	Severe
Matapeake: MkA, MkB	3o	Slight	Slight	Moderate	Slight	Slight
Mattapex: MlA, MlB	3o	Slight	Slight	Moderate to severe.	Slight to moderate.	Slight
Montalto: MsA, MsB2, MsC2	2c	Moderate: plastic subsoil.	Slight	Severe	Severe	Slight
Neshaminy:						
NeA, NeB2, NeC2	2o	Slight	Slight	Severe	Severe	Slight
NsC	2o	Moderate: stoniness	Slight	Severe	Severe	Slight
NsD, NsE For Montalto part of NsC, NsD, and NsE, see Montalto series.	2r	Moderate to severe: stoniness and slope.	Slight	Severe	Severe	Moderate to severe.
Othello: Ot	3w	Severe: high water table.	Severe	Severe	Severe	Slight
Sand and gravel pits: Sa. Unsuited to wood crops. Too variable to be rated.						
Sassafras:						
ShB2, ShC2, SlB2, SlC2	3o	Slight	Slight	Moderate	Slight	Slight
SsD	3o	Slight	Slight to moderate.	Moderate	Slight	Slight

factors in management—Continued

Windthrow hazard	Site index range				Preferred species		
	Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	For planting	For Christmas trees
Slight	65–75			65–75	Red oak, Virginia pine.	Virginia pine, loblolly pine.	Scotch pine, white pine.
Slight	65–75			65–75	Red oak, Virginia pine.	Virginia pine, loblolly pine.	Scotch pine, white pine.
Slight	65–75			65–75	Red oak, Virginia pine.	Virginia pine, loblolly pine.	Scotch pine, white pine.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine.	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine.	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine.	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine.	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine, larch.	Scotch pine, white pine, Norway spruce, blue spruce.
Slight	75–85		85–95	75–85	Red oak, yellow-poplar, shortleaf pine, Virginia pine.	Yellow-poplar, white pine, Virginia pine, loblolly pine, larch.	Scotch pine, white pine, Norway spruce, blue spruce.
Slight	70–80	75–85	85–95	70–80	Red oak, yellow-poplar, sweetgum, loblolly pine, Virginia pine.	Loblolly pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
Slight	70–80	75–85	75–85		Red oak, yellow-poplar, sweetgum, loblolly pine.	Loblolly pine, white pine, sweetgum, yellow-poplar.	Scotch pine, white pine.
Slight	70–80		85–95	70–80	Red oak, yellow-poplar, shortleaf pine, Virginia pine, black walnut, white pine, ash.	White pine, yellow-poplar, black walnut, loblolly pine.	Scotch pine, Austrian pine, white pine, Norway spruce.
Slight	75–85		85–95		Red oak, black walnut, yellow-poplar, ash.	Yellow-poplar, black walnut, white pine.	Scotch pine, white pine, Austrian pine, Norway spruce.
Slight	75–85	85–95			Red oak, black walnut, yellow-poplar, ash.	Yellow-poplar, black walnut, white pine.	Scotch pine, white pine, Austrian pine, Norway spruce.
Slight	75–85	85–95			Red oak, black walnut, yellow-poplar, ash.	Yellow-poplar, black walnut, white pine.	Scotch pine, white pine, Austrian pine, Norway spruce.
Slight	70–80	75–85			Red oak, red maple, loblolly pine, sweetgum.	Loblolly pine, sweetgum.	Scotch pine, white pine.
Slight	70–80	70–85	80–90	70–80	Red oak, loblolly pine, Virginia pine, yellow-poplar, sweetgum.	Loblolly pine, Virginia pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Austrian pine.
Slight	65–80	70–85	80–90	65–90	Red oak, Virginia pine, loblolly pine, yellow-poplar.	Loblolly pine, Virginia pine, shortleaf pine.	Scotch pine, white pine.

TABLE 5.—*Wood crops and*

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Competition for—		Erosion hazard
				Conifers	Hardwoods	
Sassafras—(Continued) SsE—For Joppa part of SsD and SsE, see Joppa series.	3r	Moderate: slope	Slight to moderate.	Moderate	Slight	Slight
Stony land, steep: St	5x	Severe: extreme stoniness; slope.	Moderate to severe.	Slight	Slight	Slight
Swamp: Sw. Unsuited to wood crops. Too variable to be rated.						
Tidal marsh: Tm. Unsuited to wood crops. Too variable to be rated.						
Watchung: WaA, WaB, WcB	1w	Severe: high water table; plastic subsoil.	Severe	Severe	Severe	Slight
Whiteford: WhB, WhC2	2o	Slight	Slight	Severe	Moderate	Slight
Woodstown: WoB	2o	Slight	Slight	Severe	Moderate	Slight

reliable estimates of yield have been determined. There are a number of Christmas tree plantations on soils of this group in the Harford County Area.

WOODLAND SUBCLASS 2r

This woodland subclass consists of well-drained or well-drained to somewhat excessively drained soils of the Chester, Glenelg, Legore, Manor, and Neshaminy series. These soils, except for a few that are highly erodible, generally have slopes more than 15 percent. They are highly productive but are moderately to severely limited for woodland use and management by slope or the hazard of erosion, or both.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 275 board feet of timber; yellow-poplar, 490 board feet of timber; loblolly pine, 680 board feet of timber or 1.3 cords of pulpwood; and Virginia pine, 1.9 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 57 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 95 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 13,750 board feet of timber; yellow-poplar, 24,400 board feet of timber; and loblolly pine, 18,800 board feet of timber or 63 cords of pulpwood.

The Glenelg and Legore soils of this subclass are good for the production of black walnut, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 2w

This woodland subclass consists of poorly drained to moderately well drained soils of the Fallsington and Glenville series, and of somewhat poorly drained to very poorly drained Alluvial land. The soils are highly productive but are moderately to severely limited for use of heavy equipment by seasonal wetness or a high water table. Seedling mortality and plant competition for trees are severe on some of these soils. Flooding is a hazard on Alluvial land.

Most of these soils are well suited to oaks and to loblolly pine. In a normal stand 50 years of age, the average annual growth per acre for oak trees on these soils is 275 board feet of timber, and the average yield per acre is about 13,750 board feet of timber. For loblolly pine, the average annual growth per acre is about 680 board feet of timber or 1.3 cords of pulpwood, and the average yield per acre is about 18,800 board feet of timber or 63 cords of pulpwood.

Fallsington and Glenville soils are well suited to yellow-poplar (fig. 11). In a normal stand 50 years of age, the average annual growth per acre on these soils is about 490 board feet of timber, and the average yield per acre is about 24,400 board feet of timber.

Some areas of these soils support good natural stands of sweetgum or of red maple, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 2c

This woodland subclass consists of well-drained soils of the Elioak (fig. 12) and Montalto series. These soils are highly

factors in management—Continued

Windthrow hazard	Site index range				Preferred species		
	Mixed oaks	Loblolly pine	Yellow-poplar	Virginia pine	In existing stands	For planting	For Christmas trees
Slight	65–80	70–82	80–90	65–80	Red oak, Virginia pine, loblolly pine, yellow-poplar.	Loblolly pine, Virginia pine, shortleaf pine.	Scotch pine, white pine.
Slight	45–55		55–65	45–55	Red oak, Virginia pine, yellow-poplar.	Virginia pine	None.
Slight	>85				Pin oak, red maple, sycamore.	White pine	Scotch pine, white pine, Norway spruce.
Slight	75–85		85–95	70–80	Red oak, yellow-poplar, Virginia pine, shortleaf pine.	White pine, yellow-poplar, Virginia pine, shortleaf pine.	Scotch pine, Norway spruce, Austrian pine, white pine, blue spruce.
Slight	75–85	80–90	85–95		Red oak, loblolly pine, yellow-poplar, sweetgum, red maple.	Loblolly pine, white pine, yellow-poplar, sweetgum.	Scotch pine, white pine, Norway spruce.

productive, but are moderately limited for use of heavy equipment by the plastic nature of the clayey subsoil. The slope is as much as 15 percent. Plant competition for trees is moderate to severe.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 275 board feet of timber; yellow-poplar, 490 board feet of timber; loblolly pine, 680 board feet of timber or 1.3 cords of pulpwood; and Virginia pine, 1.9 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 57 cords of pulpwood per acre, and at 50 years of age, a fully stocked stand yields about 95 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 13,750 board feet of timber; yellow-poplar, 24,400 board feet of timber; and loblolly pine, 18,800 board feet of timber or 63 cords of pulpwood.

The soils of this subclass are good for the production of black walnut, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 3o

This woodland subclass consists of well drained or moderately well drained soils of the Aldino, Chillum, Matapeake, Mattapex, and Sassafras series. Joppa soils are included in some areas of Sassafras soils. These soils are moderately productive and have no major limitations for woodland management. The slope is as much as 15 percent.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 200 board feet of timber; yellow-poplar, 350 board feet of timber; loblolly pine, 470 board feet of timber or 1 cord of pulpwood; and Virginia pine, 1.1 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 33 cords of pulpwood per acre, and at 50 years a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 9,750 board feet of timber; yellow-poplar, 17,600 board feet of timber; and loblolly pine, 11,400 board feet of timber or 51 cords of pulpwood.

Some areas of these soils support fairly good natural stands of sweetgum, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 3r

This woodland subclass consists of moderately well drained or well drained soils of the Aldino and Sassafras series. Joppa soils are included in some areas of Sassafras soils. These soils are moderately productive and limitations to woodland use and management are slight to moderate. Except for the Aldino soils, the slope is more than 15 percent.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 200 board feet of timber; yellow-poplar, 350 board feet of timber; loblolly pine, 470 board feet of timber or 1 cord of pulpwood; and Virginia pine, 1.1 cords of pulpwood.

Figure 11.—**Stand of yellow-poplar on nearly level Glenville silt loam.**

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 33 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 9,750 board feet of timber; yellow-poplar, 17,600 board feet of timber; and loblolly pine, 11,400 board feet of timber or 51 cords of pulpwood.

A few areas of these soils support fairly good natural stands of sweetgum, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 3w

This woodland subclass consists of moderately well drained to poorly drained soils of the Beltsville, Elkton, Hatboro, Keyport, Leonardtown, and Othello series. These soils are moderately productive but are moderately to severely limited for use of heavy equipment by seasonal wetness or a high water table. Seedling mortality and plant competition for tree species are severe on some of these soils. Flooding is a hazard on Hatboro soils.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 200 board feet of timber; and loblolly pine, 470 board feet of timber or 1 cord of pulpwood.

On Beltsville soils of this subclass, a fully stocked stand of Virginia pine at 30 years of age yields about 33 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 9,750 board feet of timber; and loblolly pine, 11,400 board feet of timber or 51 cords of pulpwood.

Yellow-poplar is not well suited to most of these soils. Some areas support fairly good stands of sweetgum or of red maple, but no reliable estimates of yield have been determined.

WOODLAND SUBCLASS 3c

Loamy and clayey land, the only mapping unit in this woodland subclass, is well drained and moderately productive but is moderately limited for use of heavy equipment by the plastic nature of the underlying clay. In most areas the slope is between 0 and 15 percent, but in a few areas it is as much as 30 percent.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed

oaks, 200 board feet of timber; and Virginia pine, 1.1 cords of pulpwood. Most other trees are not well adapted to soils of this subclass.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 33 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre of mixed upland oaks on these soils is about 9,750 board feet of timber.

WOODLAND SUBCLASS 3s

This woodland subclass consists of excessively drained soils of the Evesboro series. These soils are moderately productive. They are moderately limited by moderate seedling mortality for use of heavy equipment because their surface layer is sandy and they are seasonally droughty. The slope is as much as 15 percent.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 200 board feet of timber; loblolly pine, 470 board feet of timber or 1 cord of pulpwood; and Virginia pine, 1.1 cords of pulpwood. The soils of this subclass generally are not well suited to the production of other timber trees.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 33 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 9,750 board feet of timber; and loblolly pine, about 11,400 board feet of timber or 51 cords of pulpwood.

WOODLAND SUBCLASS 3f

This woodland subclass consists of somewhat excessively drained, or well-drained to excessively drained soils of the Brandywine and Joppa series. These soils are moderately productive. Large amounts of coarse fragments in the soil cause seasonal droughtiness and moderate seedling mortality. These fragments range in size from 2 millimeters to several inches. Slopes generally are as much as 45 percent, but are steeper in places.

In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is as follows: mixed oaks, 200 board feet of timber; yellow-poplar, 350 board feet of timber; and Virginia pine, 1.1 cords of pulpwood.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 33 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 54 cords per acre.

In a normal stand 50 years of age, the yield per acre on these soils is as follows: mixed oaks, 9,750 board feet of

Figure 12.—**Christmas tree plantation of Scotch pine on Elioak silt loam.**

timber; and yellow-poplar, 17,600 board feet of timber. The soils of this subclass generally are not well suited to the production of other timber species.

WOODLAND SUBCLASS 4w

This woodland subclass consists of somewhat poorly drained soils of the Kelly series. These soils are low in productivity and are severely limited for use of heavy equipment by seasonal wetness or a high water table and the very plastic clay subsoil. The slope is as much as 25 percent.

Black oak and Virginia pine are the most common economic timber species for planting on these soils. In a normal stand 50 years of age, the average annual growth per acre for trees on these soils is 125 board feet of timber for oaks, and 0.6 cord of pulpwood for Virginia pine. The soils of this subclass generally are not well suited to the production of other timber species. Some useful redcedar and shortleaf pine grow in places.

At 30 years of age, a fully stocked stand of Virginia pine on these soils yields about 19 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 31 cords per acre.

In a normal stand 50 years of age on these soils, the yield for oaks is about 6,300 board feet of timber.

WOODLAND SUBCLASS 4c

Chrome channery silty clay loam, 15 to 45 percent slopes, is the only soil in this woodland subclass. It is well drained and low in productivity. This soil is moderately to severely limited for use of heavy equipment by the very plastic nature of the clayey subsoil and by slope. This soil is moderately deep over serpentine bedrock. Content of nickel in the subsoil is extremely high so only certain tree species can adapt to this soil. In a few areas the slope is more than 45 percent.

Red oak and Virginia pine are the most common economic timber species for planting on this soil. In a normal stand 50 years of age, the average annual growth per acre for trees on this soil is 125 board feet of timber for oaks, and 0.6 cord of pulpwood for Virginia pine. The soils of this subclass generally are poorly suited to the production of other timber species.

At 30 years of age, a fully stocked stand of Virginia pine on this soil yields about 19 cords of pulpwood per acre, and at 50 years of age a fully stocked stand yields about 31 cords per acre.

In a normal stand 50 years of age, the yield for oaks on this soil is about 6,300 board feet of timber.

WOODLAND SUBCLASS 5x

This woodland subclass consists of Stony land, steep, which is very low in productivity and is severely limited for use of heavy equipment by extreme stoniness and steep slopes. Some areas support stands of red oak, yellow-poplar, or Virginia pine. Wood crop production generally is not feasible. Virginia pine is suitable for planting where additional cover is desired for watershed protection and wildlife habitat.

Wildlife

The production of a wildlife species largely depends on the amount and distribution of food, shelter, and water. If any of these elements is missing, inadequate, or inaccessible, the species is absent or scarce. The kinds of wildlife that live in a given area and the number of each kind are closely related to land use, to the resulting kinds and patterns of vegetation, and to the supply and distribution of water. These, in turn, are generally related to the kinds of soil.

Habitat for wildlife generally can be created or improved by planting suitable vegetation, by properly managing the existing plant cover, by fostering the natural establishment of desirable plants, or by using a combination of these measures.

This section rates the soils of the Harford County Area according to their suitability for seven elements of wildlife habitat and for three general kinds of wildlife habitat. It also explains the elements and the general kinds of wildlife habitat and the ratings. Not considered in the ratings are present land use, the location of a soil in relation to other soils, and the mobility of wildlife.

The suitability ratings in this section can be used as an aid in—

1. Planning the broad use of parks, refuges, nature-study areas, and other recreational developments for wildlife.
2. Selecting the better soils for creating, improving, or maintaining specific kinds of wildlife habitat elements.
3. Determining the related intensity of management needed for individual habitat elements.
4. Eliminating sites that would be difficult or impractical to manage for specific kinds of wildlife.
5. Determining areas that are suitable for acquisition for use by wildlife.

Each soil in the Harford County Area is rated in table 6 according to its suitability for various kinds of plants and other elements that make up wildlife habitat. The seven elements considered important are as follows:

Grain and seed crops.—These crops include such seed producing annuals as corn, sorghum, wheat, barley, oats, millet, buckwheat, cowpeas, and other plants commonly grown for grain or for seed. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

Domestic grasses and legumes.—This group is made up of domestic perennial grasses and herbaceous legumes that are established by planting, and that furnish wildlife cover and food. Among the plants are bluegrass, fescue, brome, timothy, orchardgrass, reed canarygrass, clover, and alfalfa. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, slope, surface stoniness, hazard of flooding, and texture of the surface layer and subsoil.

Wild herbaceous plants.—In this group are native or introduced perennial grasses and weeds that generally are established naturally. They include bluestem, quackgrass, panicgrass, goldenrod, wild carrot, nightshade, and dandelion. They principally provide food and cover to upland kinds of wildlife. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, natural drainage, surface stoniness, hazard of flooding or ponding, and texture of the surface layer and subsoil.

Hardwoods.—This element includes nonconiferous trees, shrubs, and woody vines that produce nuts or other fruits,

buds, catkins, twigs, or foliage that wildlife eat. They generally are established naturally but can be planted. Among the native species are oak, cherry, maple, poplar, apple, hawthorn, dogwood, persimmon, sumac, sassafras, hazelnut, black walnut, hickory, sweetgum, bayberry, blueberry, huckleberry, blackhaw, viburnum, grape, and briers. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, and natural drainage.

Also in this group are several varieties of fruiting shrubs that are raised commercially for planting. Autumn-olive, Amur honeysuckle, Tartarian honeysuckle, crabapple, multiflora rose, highbush cranberry, and silky cornel dogwood are some of the shrubs that generally are available and can be planted on soils that are rated well suited. Hardwoods that are not available commercially can commonly be transplanted successfully.

Conifers.—This element consists of cone-bearing evergreen trees and shrubs that are used by wildlife primarily as cover, although they also provide browse and seeds or fruitlike cones. Among these are Norway spruce, Virginia pine, loblolly pine, shortleaf pine, pond pine, Scotch pine, redcedar, and Atlantic white-cedar. Generally, the plants are established naturally in areas where cover of weeds and sod is thin, but they also can be planted. The major soil properties affecting this habitat element are effective rooting depth, available water capacity, and natural drainage.

Wetland plants.—This group is made up of wild, herbaceous, annual and perennial plants, exclusive of submerged or floating aquatics, that grow on moist to wet sites. They produce food and cover used mainly by wetland forms of wildlife. They include smartweed, wild millet, bulrush, sedges, barnyard grass, pondweed, duckweed, duckmillet, arrow-arum, pickerelweed, water willow, wetland grasses, wildrice, and cattails. The major soil properties affecting this habitat element are natural drainage, surface stoniness, slope, and texture of the surface layer and subsoil.

Shallow water areas.—These are areas of shallow water, generally not exceeding 5 feet in depth, near food and cover for wetland wildlife. They may be naturally wet areas, or those created by dams or levees, or by water-control devices in marshes or streams. Examples of such developments are wildlife ponds, beaver ponds, muskrat marshes, waterfowl feeding areas, and wildlife watering developments. The major soil properties affecting this habitat element are depth to bedrock, natural drainage, slope, surface stoniness, and permeability. Natural wet areas that are aquifer fed are rated on the basis of drainage class. Permeability is not considered. Permeability of the soil would apply only to those nonaquifer areas that have a potential for development, and water is assumed to be available offsite.

Table 6 also rates the soils according to their suitability for three general kinds of wildlife habitat in the county—openland, woodland, and wetland wildlife.

Openland wildlife.—Examples of openland wildlife are quail, pheasant, meadowlark, field sparrow, dove, cottontail rabbit, red fox, and woodchuck. These birds and mammals normally make their home in areas of cropland, pasture, meadow, and lawns and in areas overgrown with grasses, herbs, shrubs, and vines.

Woodland wildlife.—Among the birds and mammals that prefer woodland are ruffed grouse, woodcock, thrush, vireo, scarlet tanager, gray and red squirrels, gray fox, white-tailed deer, raccoon, and wild turkey. They obtain food and cover in stands of hardwoods, conifers, or shrubs, or a mixture of these plants.

Wetland wildlife.—Ducks, geese, rails, herons, shore birds, and muskrat are familiar examples of birds and mammals that normally make their home in such wet areas as ponds, marshes, and swamps.

Each rating of wildlife habitat in table 6 is based on the ratings of the habitat elements in the first part of the table. For openland wildlife, the rating is based on the ratings shown for grain and seed crops, domestic grasses and legumes, wild herbaceous upland plants, and either hardwood woody plants, or coniferous woody plants, whichever is most applicable. The rating for woodland wildlife is based on the ratings listed for domestic grasses and legumes, wild herbaceous upland plants, and either hardwood woody plants or coniferous woody plants, whichever is most applicable. For wetland wildlife, the rating is based on the ratings shown for wetland food and cover plants and shallow water areas.

On soils rated *good*, habitat generally is easily created, improved, or maintained. The soils have few or no soil limitations in habitat management and satisfactory results are well assured.

On soils rated *fair*, habitat usually can be created, improved, or maintained, but the soils have moderate limitations that affect the creation, improvement, or maintenance of the habitat. A moderate intensity of management and fairly frequent attention may be required to assure satisfactory results.

On soils rated *poor*, habitat can usually be created, improved, or maintained, but there are rather severe soil limitations. Habitat management can be difficult and expensive and require intensive effort. Satisfactory results are questionable.

On soils rated *very poor*, creating, improving, or maintaining habitat is impractical because soil limitations are very severe. Unsatisfactory results are probable.

Engineering Uses of the Soils[4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissioners, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, drainage condition, shrink-swell potential, grain size, plasticity, and reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.

[4] RICHARD R. NAGEL, assistant State conservation engineer, Soil Conservation Service, helped prepare this section.

TABLE 6.—*Suitability of the soils for elements of wildlife habitat and kinds of wildlife*

Soil series and map symbols	Elements of wildlife habitat							
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland
Aldino:								
AdA	Fair	Good	Good	Good	Good	Poor	Poor	Good
AdB, AdC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
AsB	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor
Alluvial land: Av	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair
Baile:								
BaA	Poor	Fair	Fair	Good	Fair	Good	Good	Fair
BaB	Poor	Fair	Fair	Good	Fair	Poor	Very poor	Fair
Beltsville:								
BeA, BeB	Fair	Good	Good	Good	Good	Poor	Poor	Good
BeC	Poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor
Brandywine:								
BrC2	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
BrD3	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor
BrE3	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor
Chester:								
CcA, CcB2, CgB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
CcC2, CgC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
CgD2	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair
Chillum: ChB2, CkC2. For Neshaminy part of CkC2, see Neshaminy series.	Fair	Good	Good	Good	Good	Poor	Very poor	Good
Chrome: CrE	Very poor	Very poor	Poor	Poor	Poor	Very poor	Very poor	Poor
Codorus: Cu	Fair	Good	Good	Good	Good	Poor	Poor	Good
Comus: Cv	Good	Good	Good	Good	Good	Very poor	Very poor	Good
Cut and fill land: Cx. Material too variable to be rated.								
Delanco:								
DcA	Good	Good	Good	Good	Good	Poor	Poor	Good
DcB	Good	Good	Good	Good	Good	Poor	Very poor	Good
Elioak:								
EhB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
EhC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
Elkton: En	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair
Elsinboro:								
EsA, EsB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
EsC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
Evesboro: EvC	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor

Fallsington: Fs	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair
Glenelg:								
GcB2, GgB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
GcC2, GcC3, GgC2, GgC3.	Fair	Good	Good	Good	Good	Very poor	Very poor	Fair
GcD2, GcD3, GgD2, GgD3.	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair
Glenville:								
GnA	Fair	Good	Good	Good	Good	Poor	Poor	Good
GnB	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
Hatboro: Hb	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair
Joppa:								
JpB	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
JpC	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
Kelly:								
KeB, KeC2	Fair	Good	Good	Good	Good	Poor	Very poor	Good
KfD	Very poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor
Keyport:								
KpA	Good	Good	Good	Good	Good	Poor	Poor	Good
KpB	Good	Good	Good	Good	Good	Poor	Very poor	Good
Kinkora:								
KrA	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair
KrB	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair
Legore:								
LeB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
LeC2, LgC3	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
LeD2, LgD3	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair
LeE	Very poor	Fair	Good	Good	Good	Very poor	Very poor	Poor
LfC, LfD, LfE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor
Leonardtown: Lr	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair
Loamy and clayey land:								
LyB	Good	Good	Good	Good	Good	Poor	Very poor	Good
LyD	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
LyE	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair
Manor:								
MbB2, MbC2, MbC3, McB2, McC2, McC3.	Fair	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
MbD2, MbD3, McD2, McD3.	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
MdE, MfE	Very poor	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor
MgC, MgD	Not suited	Poor	Fair	Fair	Fair	Very poor	Very poor	Poor
For Glenelg part of MgC and MgD, see Glenelg series.								
Matapeake: MkA, MkB	Good	Good	Good	Good	Good	Poor	Very poor	Good
Mattapex:								
MlA	Good	Good	Good	Good	Good	Poor	Poor	Good
MlB	Good	Good	Good	Good	Good	Poor	Very poor	Good
Montalto:								
MsA, MsB2	Good	Good	Good	Good	Good	Very poor	Very poor	Good
MsC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good

TABLE 6.—*Suitability of the soils for elements of wildlife habitat and kinds of wildlife*—Continued

Soil series and map symbols	Elements of wildlife habitat							
	Grain and seed crops	Domestic grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland
Neshaminy:								
NeA, NeB2	Good	Good	Good	Good	Good	Very poor	Very poor	Good
NeC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
NsC, NsD, NsE	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor
For Montalto part of NsC, NsD, and NsE, see Montalto series.								
Othello: Ot	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair
Sand and gravel pits: Sa. Material too variable to be rated.								
Sassafras:								
ShB2, SlB2	Good	Good	Good	Good	Good	Poor	Very poor	Good
ShC2, SlC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
Sassafras and Joppa: SsD, SsE. For Joppa part of SsD and SsE, see Joppa series.	Poor	Fair	Fair	Fair	Fair	Very poor	Very poor	Fair
Stony land, steep: St	Very poor	Very poor	Very poor	Poor	Poor	Very poor	Very poor	Very poor
Swamp: Sw	Not suited	Not suited	Not suited	Very poor	Very poor	Good	Good	Not suited
Tidal marsh: Tm	Not suited	Not suited	Not suited	Not suited	Not suited	Good	Poor	Not suited
Watchung:								
WaA	Poor	Fair	Fair	Good	Fair	Good	Good	Fair
WaB	Poor	Fair	Fair	Good	Fair	Poor	Very poor	Fair
WcB	Very poor	Poor	Fair	Good	Fair	Good to poor.	Good to very poor.	Poor
Whiteford: WhB, WhC2	Fair	Good	Good	Good	Good	Very poor	Very poor	Good
Woodstown: WoB	Good	Good	Good	Good	Good	Poor	Poor	Good

3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7 and 8, which show, respectively, several estimated soil properties significant in engineering and interpretations for various engineering uses.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 8. It also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, particularly those that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning in soil science that might not be familiar to engineers. These terms are defined in the Glossary.

Engineering classification

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*13*) used by the SCS engineers, Department of Defense, and others, and the system adopted by the American Association of State Highway Officials (AASHO) (*1*).

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

The AASHO system is used to classify soils according to those properties that affect their use in highway construction and maintenance. In this system, a soil is assigned to one of seven basic groups ranging from A-1 through A-7. This classification is based on grain-size distribution, liquid limit, and plasticity index. In group A-1 are soils that have high bearing strength and are the best soils for subgrade (foundation). At the other extreme, in group A-7, are soils that have low strength if wet and are the poorest soils for subgrade. If laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The estimated AASHO classification, without group index numbers, is given in table 7 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Estimated engineering properties

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for typical soil profiles, of layers sufficiently different to have different significance in engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties.

Depth to bedrock is the distance from the surface to the underlying rock layer.

Depth to seasonal high water table is the distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary at the back of this soil survey.

The table also shows the thickness and depth from the surface of the textural materials in the specific soil profiles described in the section "Descriptions of the Soils." The thickness of the surface layer applies only to soils that are slightly or moderately eroded. The surface layer of severely eroded soils is thinner or can be completely removed, and the underlying horizons are closer to the surface than is indicated in the table.

Mechanical analysis is expressed as the estimated range in percentages, by weight, of soil particles that pass a sieve of a specified size. Sand and other coarser materials do not pass through the No. 200 sieve. Silt is that material larger than 0.002 millimeter in diameter that passes through the No. 200 sieve, and clay is that fraction passing through the No. 200 sieve that is smaller than 0.002 millimeter in diameter. The clay fraction was determined by the hydrometer method, rather than the pipette method used by most soil scientists in determining the clay content of soil samples.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. Lateral seepage or such transient soil features as a plowpan or a surface crust are not considered in the estimates in table 7.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crops.

Reaction is the degree of acidity or alkalinity of a soil,

TABLE 7.—*Estimates of soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in the first column of this table.

Soil series and map symbols	Depth to bedrock	Depth to high water table	Depth from surface[1]	USDA texture	Classification	
					Unified	AASHO
	Ft	*Ft*	*In*			
Aldino: AdA, AdB, AdC, AsB	3½–6	1½–2½	0–7	Silt loam	ML	A–4
			7–24	Silt loam, silty clay loam.	CL	A–6
			24–36	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			36–49	Loam, silt loam	SM, ML, MH	A–2, A–4, A–5
Alluvial land: Av. No valid estimates can be made.						
Baile: BaA, BaB	5–10	0–1	0–12	Silt loam	ML	A–4
			12–40	Silt loam, silty clay loam, clay loam.	MH, CL	A–6, A–7
			40–64	Sandy loam, loam, silt loam, clay loam.	SM, MH	A–4, A–6, A–7
Beltsville: BeA, BeB, BeC	>10	1½–2½	0–16	Silt loam	ML	A–4
			16–42	Loam, silt loam, silty clay loam.	ML, CL	A–4, A–6
			42–60	Sandy loam, sandy clay loam, clay loam, silt loam.	SM, ML, CL	A–2, A–4, A–6
Brandywine: BrC2, BrD3, BrE3	4–10	>5	0–7	Loam, gravelly loam	SM, ML	A–2, A–4
			7–19	Gravelly loam	SM, ML	A–2, A–4
			19–72	Gravelly loamy coarse sand, sandy loam.	SP, SM	A–2, A–3, A–4
Chester: CcA, CcB2, CcC2, CgB2, CgC2, CgD2.	5–10	>5	0–9	Silt loam	ML	A–4
			9–30	Loam, clay loam, silt loam, silty clay loam.	SM, SC, ML, CL	A–4, A–5, A–6
			30–60	Sandy loam to silt loam.	SM, SC, ML	A–2, A–4, A–5
*Chillum: ChB2, CkC2 For Neshaminy part of CkC2, see Neshaminy series.	>10	>5	0–30	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			30–54	Gravelly loam, sandy loam, sandy clay loam.	SM, SC, GM, GC	A–2
Chrome: CrE	1½–3½	>5	0–16	Silt loam, silty clay loam, silty clay.	MH, CH	A–7
			16–20	Clay loam, silty clay loam, silty clay.	CH, ML, MH, GM, GC	A–2, A–7
			20	Serpentine.		
Codorus: Cu	6–10	1½–2	0–48	Loam, silt loam, silty clay loam.	ML, CL, MH	A–4, A–5, A–6
			48–54	Stratified, variable material.	----------	----------
Comus: Cv	6–10	>4	0–34	Silt loam	ML	A–4
			34–60	Gravelly sandy loam, loam, silt loam, silty clay loam.	SM, ML, CL	A–2, A–4, A–6
Cut and fill land: Cx. No valid estimates can be made.						
Delanco: DcA, DcB	5–20	1½–2	0–10	Silt loam	ML	A–4
			10–29	Loam, clay loam, silt loam, silty clay loam.	ML, CL	A–4, A–6
			29–60	Very fine sandy loam, loam, clay loam.	ML, MH	A–4, A–5, A–6

See footnotes at end of table.

significant in engineering

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to The symbol > means more than, < means less than]

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability range	Available water capacity	Reaction (unlimed)	Shrink-swell potential
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Pct					*In per hr*	*In per in of soil*	*pH*	
0	95–100	95–100	90–100	80–95	0.6–6.0	0.16–0.27	4.5–5.5	Low.
0	95–100	90–100	85–100	60–95	0.6–2.0	0.12–0.24	4.5–5.5	Low to moderate.
0	85–100	80–100	65–100	50–100	<0.2	0.12–0.24	4.5–6.0	Low.
0–10	85–100	80–100	65–100	30–100	0.6–2.0	0.12–0.24	5.1–6.5	Low.
0	90–100	90–100	85–100	60–85	0.2–0.6	0.16–0.27	4.5–5.5	Low.
0	95–100	90–100	85–100	65–90	0.06–0.6	0.12–0.24	4.5–5.5	Low to moderate.
0	85–100	80–100	75–100	40–85	0.06–0.6	0.10–0.24	4.5–5.5	Low.
0	95–100	90–100	75–100	60–90	0.6–2.0	0.18–0.24	4.0–5.0	Low.
0	95–100	90–100	90–100	65–95	<0.2	0.10–0.18	4.0–5.0	Low.
0–10	75–100	65–100	55–100	25–80	0.2–6.0	0.08–0.18	4.0–5.0	Low.
0–25	75–100	60–90	50–75	15–60	2.0–6.0	0.16–0.23	4.5–6.0	Low.
15–35	70–100	60–90	40–60	25–60	2.0–6.0	0.06–0.14	4.5–5.5	Low.
0–25	65–100	50–80	40–60	5–45	2.0–6.0	0.06–0.12	4.5–5.5	Low.
0–15	90–100	90–100	75–90	55–75	0.6–2.0	0.12–0.16	5.1–6.0	Low.
0–10	85–100	85–100	65–95	40–80	0.6–2.0	0.10–0.14	5.1–6.0	Low.
0–10	85–100	85–100	75–95	30–65	0.6–2.0	0.08–0.12	4.5–5.5	Low.
0	80–100	65–100	60–100	55–90	0.2–2.0	0.18–0.27	4.0–5.0	Low.
0–10	60–95	55–90	30–60	15–35	0.2–2.0	0.08–0.16	4.0–5.0	Low.
0–5	70–100	65–100	65–100	60–100	0.6–2.0	0.18–0.24	6.0–7.0	Moderate to high.
10–35	30–85	25–75	25–70	20–60	0.6–2.0	0.08–0.24	6.0–7.5	Moderate.
0	65–100	65–100	60–100	55–95	0.6–2.0	0.12–0.24	4.5–5.5	Low to moderate.
0–30								
0–5	95–100	90–100	70–85	65–80	0.6–2.0	0.18–0.24	4.5–6.0	Low.
0–40	90–100	85–100	55–80	30–65	0.6–2.0	0.12–0.24	4.5–6.0	Low.
0–5	90–100	85–100	75–90	65–85	0.6–2.0	0.18–0.24	5.0–5.5	Low.
0–5	90–100	85–100	80–100	70–95	0.2–0.6	0.18–0.24	4.5–5.0	Low to moderate.
0–15	75–95	65–85	55–75	50–70	0.6–2.0	0.15–0.22	4.5–5.0	Low.

TABLE 7.—*Estimates of soil properties*

Soil series and map symbols	Depth to bedrock	Depth to high water table	Depth from surface[1]	USDA texture	Classification	
					Unified	AASHO
	Ft	*Ft*	*In*			
Elioak: EhB2, EhC2	5–10	>5	0–15	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			15–40	Silty clay, silty clay loam.	CL, CH, MH	A–4, A–6, A–7
			40–65	Silt loam, loam, fine sandy loam.	SM, ML	A–5
Elkton: En	>10	0–1	0–7	Loam, silt loam	ML, CL	A–4, A–6
			7–34	Clay, silty clay, silty clay loam.	CL, CH, MH	A–6, A–7
			34–60	Silty clay loam, sandy clay loam, sandy loam, loamy sand.	SM, SC, ML, CL	A–2, A–4, A–6
Elsinboro: EsA, EsB2, EsC2	6–20	>4	0–9	Loam	SM, ML	A–4
			9–32	Loam, clay loam, silt loam, silty clay loam.	SC, ML, CL	A–4, A–6
			32–60	Loam, sandy loam, fine sandy loam.	SM, SC, ML	A–2, A–4
Evesboro: EvC	>10	>10	0–60	Loamy sand, sand	SP, SM	A–2, A–3
Fallsington: Fs	>10	0–1	0–15	Sandy loam, loam	SM, SC, ML	A–2, A–4
			15–30	Sandy loam, loam, sandy clay loam.	SM, SC, ML	A–2, A–4
			30–50	Sand, loamy sand, sandy loam.	SM, SP, SM	A–2, A–3
Glenelg: GcB2, GcC2, GcC3, GcD2, GcD3, GgB2, GgC2, GgC3, GgD2, GgD3.	4–10	>5	0–7	Loam	ML	A–4
			7–26	Loam, silt loam, silty clay loam.	SM, ML, CL	A–4, A–6
			26–60	Loam	SM, ML	A–4, A–5
Glenville: GnA, GnB	4–6	1–3	0–7	Silt loam	ML, CL	A–4
			7–15	Loam, silt loam, silty clay loam.	ML, CL	A–4, A–6
			15–28	Loam, silt loam, silty clay loam.	ML, CL	A–4
			28–60	Loam, silt loam, fine sandy loam.	SM, SC, ML	A–4
Hatboro: Hb	4–10	0–1	0–10	Silt loam	ML, CL	A–4, A–6
			10–41	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			41–60	Sandy loam, loam, sandy clay loam, silt loam, silty clay loam.	SM, GM, ML, CL	A–1, A–2, A–4, A–6
Joppa: JpB, JpC	>10	>5	0–29	Gravelly sandy loam, loam.	SM, GM	A–1, A–2, A–4
			29–72	Gravelly sand, loamy sand.	GP, GM	A–1, A–2
Kelly: KeB, KeC2, KfD	3½–5	1–2	0–11	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			11–34	Clay, clay loam	MH, CL, CH	A–6, A–7
			34–54	Clay loam, sandy clay loam.	SC, CL	A–4, A–6
Keyport: KpA, KpB	>10	1½–3	0–7	Silt loam	ML	A–4
			7–42	Silty clay loam, silty clay, clay.	CL, CH, MH	A–6, A–7
			42–55	Silty clay loam, silty clay, silt loam, clay.	CL, CH, MH, ML	A–6, A–7, A–4

See footnotes at end of table.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability range	Available water capacity	Reaction (unlimed)	Shrink-swell potential
	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)				
Pct					*In per hr*	*In per in of soil*	*pH*	
0–5	90–100	90–100	90–100	80–90	0.6–2.0	0.18–0.24	5.1–5.5	Low.
0–5	90–100	90–100	90–100	80–100	0.6–2.0	0.18–0.24	5.1–5.5	Low to moderate.
0–10	75–100	70–100	70–100	40–65	0.6–2.0	0.12–0.18	5.1–5.5	Low.
0	90–100	85–100	80–100	55–90	0.2–2.0	0.18–0.27	4.0–5.5	Low.
0	95–100	80–100	80–100	60–100	<0.2	0.18–0.24	4.0–5.5	Moderate.
0	90–100	85–100	65–100	30–100	0.2–6.0	0.12–0.24	4.0–5.0	Low to moderate.
0	85–100	80–100	75–90	40–75	0.6–2.0	0.12–0.24	4.5–5.5	Low.
0	85–100	80–100	65–95	40–85	0.6–2.0	0.12–0.24	4.5–5.5	Low.
0–10	60–100	50–100	45–100	40–95	0.6–6.0	0.08–0.18	4.5–5.5	Low.
0	90–100	80–100	50–95	0–20	>6.0	0.06–0.10	4.0–5.5	Low.
0	95–100	90–100	70–100	20–60	0.6–6.0	0.10–0.24	4.0–5.5	Low.
0	95–100	90–100	70–100	20–60	0.6–2.0	0.10–0.18	4.0–5.5	Low.
0	90–100	90–100	50–100	5–35	2.0–6.0	0.06–0.12	4.0–5.0	Low.
0–15	90–100	65–100	60–90	55–85	0.6–2.0	0.14–0.24	5.0–6.0	Low.
0–10	85–100	65–100	55–90	35–90	0.6–2.0	0.10–0.14	5.0–6.0	Low.
0–10	85–100	65–100	55–90	35–90	0.6–2.0	0.08–0.12	4.5–6.0	Low.
0–5	85–100	85–95	75–85	65–80	0.6–2.0	0.16–0.20	5.0–5.5	Low.
0–5	85–100	85–100	80–95	65–90	0.6–2.0	0.12–0.16	4.5–5.5	Low.
0–5	85–100	85–100	80–100	65–90	0.2–0.6	0.10–0.14	4.5–5.5	Low.
0–10	75–90	75–90	65–85	40–75	0.6–2.0	0.10–0.14	4.5–5.0	Low.
0–5	95–100	95–100	80–100	70–90	0.6–2.0	0.16–0.20	5.6–7.3	Low.
0–5	65–100	60–100	55–95	55–70	0.6–2.0	0.14–0.18	5.1–6.0	Low.
0–20	50–85	45–80	45–80	15–70	2.0–6.0	0.06–0.20	4.5–6.0	Low.
0–10	40–80	30–70	30–65	15–45	0.6–6.0	0.12–0.18	4.0–5.0	Low.
0–10	40–80	35–60	30–60	5–15	2.0–6.0	0.06–0.10	4.0–5.0	Low.
0–10	95–100	95–100	90–100	80–100	0.2–2.0	0.16–0.27	5.1–6.0	Moderate.
0–10	95–100	95–100	90–100	90–100	<0.2	0.16–0.24	5.1–6.5	High.
0–10	85–100	80–100	80–100	45–90	0.2–0.6	0.14–0.24	6.0–7.0	Moderate to high.
0	95–100	90–100	75–100	60–90	0.6–2.0	0.14–0.24	4.0–5.0	Low.
0	95–100	90–100	85–100	70–100	<0.2	0.18–0.24	4.0–5.0	Moderate.
0	90–100	80–100	75–100	65–100	<0.6	0.14–0.24	4.0–5.0	Low to moderate.

TABLE 7.—*Estimates of soil properties*

Soil series and map symbols	Depth to bedrock	Depth to high water table	Depth from surface[1]	USDA texture	Classification	
					Unified	AASHO
	Ft	*Ft*	*In*			
Kinkora: KrA, KrB	5–20	0–1	0–12	Silt loam	ML	A–4
			12–31	Silty clay loam, silty clay, clay, clay loam.	CL, CH	A–6, A–7
			31–50	Silt loam, loam, fine sandy loam.	ML, SM, MH	A–4, A–5
Legore: LeB2, LeC2, LeD2, LeE, LfC, LfD, LfE, LgC3, LgD3.	5–10	>4	0–6	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			6–30	Clay loam, silty clay loam.	ML, MH, CL	A–4, A–6, A–7
			30–60	Loam, silt loam, silty clay loam.	ML, CL	A–4, A–6
Leonardtown: Lr	>10	0–1	0–16	Silt loam	ML	A–4
			16–45	Silt loam, loam, silty clay loam.	ML, CL	A–4, A–6
			45–60	Loam, silt loam, silty clay loam.	ML, CL	A–4, A–6
Loamy and clayey land: LyB, LyD, LyE.	>10	>5	(2)	Sandy loam to silt loam.	SM, ML	A–2, A–4
			(2)	Clay, silty clay, sandy clay.	CL, CH	A–7
*Manor: MbB2, MbC2, MbC3, MbD2, MbD3, McB2, McC2, McC3, McD2, McD3, MdE, MfE, MgC, MgD. For Glenelg part of MgC and MgD, see Glenelg series.	6–10	>5	0–23	Loam	SM, ML	A–4, A–5
			23–56	Loam, sandy loam	SM, ML	A–2, A–4, A–5
Matapeake: MkA, MkB	>10	>4	0–9	Silt loam	ML, CL	A–4, A–6
			9–32	Silt loam, silty clay loam.	ML, CL	A–4, A–6, A–7
			32–60	Sand, loam, loamy sand, sandy loam.	SM, SC, ML	A–2, A–4
Mattapex: MlA, MlB	>10	1½–2½	0–7	Silt loam	ML, CL	A–4
			7–38	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			38–72	Loamy sand to silt loam.	SM, SC, ML, CL	A–2, A–4, A–6
Montalto: MsA, MsB2, MsC2	5–12	>5	0–11	Silt loam	ML, CL	A–4, A–6
			11–58	Clay, clay loam, silty clay loam, silty clay.	MH, CL, CH	A–6, A–7
			58–74	Loam, clay loam, silty clay loam, silt loam.	SM, MH, ML, CL	A–4, A–6, A–7
*Neshaminy: NeA, NeB2, NeC2, NsC, NsD, NsE. For Montalto part of NsC, NsD, and NsE, see Montalto series.	4–10	>4	0–9	Silt loam	ML, CL	A–4, A–6
			9–49	Clay loam, silty clay loam.	ML, CL	A–4, A–5, A–6
			49–64	Sandy loam, loam, silt loam, clay loam.	SM, SC, ML, CL	A–2, A–4, A–6
Othello: Ot	>10	0–1	0–7	Silt loam	ML, CL	A–4, A–6
			7–33	Silt loam, silty clay loam.	ML, CL	A–4, A–6
			33–60	Sandy loam, loamy sand	SM, SC	A–2, A–4
*Sassafras: ShB2, ShC2, SlB2, SlC2, SsD, SsE. For Joppa part of SsD and SsE, see Joppa series.	>10	>4	0–12	Sandy loam, loam	SM, ML	A–2, A–4
			12–40	Sandy clay loam, sandy loam, loam.	SM, SC, ML, CL	A–2, A–4, A–6
			40–60	Sandy loam, loamy sand, sand.	SM, SP-SM	A–2
Stony land, steep: St. No valid estimates can be made.						

See footnotes at end of table.

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability range	Available water capacity	Reaction (unlimed)	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
Pct					*In per hr*	*In per in of soil*	*pH*	
0	95–100	90–100	90–100	50–90	0.2–2.0	0.18–0.24	4.0–5.0	Low.
0	95–100	95–100	95–100	80–90	<0.2	0.18–0.24	4.0–5.0	Moderate.
0	85–100	85–100	75–95	40–65	0.6–6.0	0.12–0.24	4.0–5.0	Low.
0–15	90–100	90–100	80–100	55–85	0.2–6.0	0.14–0.24	5.0–6.0	Low.
0–15	90–100	90–100	75–100	60–85	0.6–2.0	0.12–0.24	5.5–6.5	Low to moderate.
0–15	85–100	70–100	60–95	50–85	0.6–6.0	0.10–0.18	5.5–6.5	Low to moderate.
0	95–100	95–100	95–100	90–100	0.2–0.6	0.18–0.24	4.0–5.5	Low.
0	95–100	95–100	90–100	80–100	<0.2	0.18–0.24	4.0–5.5	Low.
0	90–100	85–95	70–95	60–85	0.2–2.0	0.12–0.24	4.0–5.5	Low.
0	95–100	95–100	90–100	30–90	0.2–6.0	0.12–0.24	4.0–5.0	Low.
0	95–100	95–100	85–100	60–100	<0.2	0.12–0.20	4.0–5.0	Moderate to high.
0–10	60–100	55–100	50–90	40–80	0.6–2.0	0.06–0.12	4.5–5.5	Low.
0–5	60–100	60–100	50–70	30–60	0.6–6.0	0.06–0.10	4.5–5.5	Low.
0	95–100	95–100	80–100	55–90	0.6–2.0	0.14–0.24	4.5–5.5	Low.
0	95–100	95–100	80–100	65–90	0.2–2.0	0.18–0.24	4.5–5.5	Low.
0	95–100	95–100	60–100	15–60	0.6–6.0	0.06–0.18	4.5–5.5	Low.
0	95–100	95–100	80–100	55–90	0.2–2.0	0.14–0.24	4.0–5.5	Low.
0	95–100	95–100	80–100	60–100	0.2–0.6	0.18–0.24	4.5–5.5	Low.
0–5	95–100	95–100	60–100	15–60	0.6–6.0	0.10–0.16	4.0–5.0	Low.
0–5	95–100	95–100	80–100	75–100	0.6–2.0	0.18–0.24	5.1–6.5	Low.
0–5	95–100	95–100	80–100	65–100	0.2–0.6	0.08–0.12	5.1–6.5	Moderate to high.
0–10	85–100	75–100	60–100	45–75	0.6–2.0	0.08–0.12	5.1–6.5	Low to moderate.
0–10	80–100	80–100	70–100	65–90	0.6–2.0	0.14–0.24	5.1–6.0	Low.
0–10	80–100	80–100	70–100	65–90	0.6–2.0	0.18–0.24	5.1–6.5	Low to moderate.
0–25	50–100	50–100	40–95	30–85	0.2–2.0	0.09–0.20	5.1–6.5	Low.
0	95–100	95–100	90–100	60–100	0.6–2.0	0.16–0.27	4.0–5.0	Low.
0	95–100	95–100	90–100	60–100	0.2–0.6	0.12–0.24	4.0–5.0	Low.
0	85–100	80–100	50–100	15–70	0.6–6.0	0.06–0.12	4.0–5.0	Low.
0	80–100	80–100	60–100	15–65	0.6–6.0	0.08–0.24	4.0–5.5	Low.
0	75–100	55–100	50–100	25–75	0.6–2.0	0.08–0.24	4.0–5.5	Low.
0	70–100	60–100	50–80	10–30	0.6–6.0	0.04–0.12	4.0–5.5	Low.

TABLE 7.—*Estimates of soil properties*

Soil series and map symbols	Depth to bedrock	Depth to high water table	Depth from surface[1]	USDA texture	Classification	
					Unified	AASHO
	Ft	*Ft*	*In*			
Swamp: Sw. No valid estimates can be made.						
Tidal marsh: Tm. No valid estimates can be made.						
Watchung: WaA, WaB, WcB	5–10	0–1	0–12	Silt loam	ML, CL	A–4, A–6
			12–48	Clay, silty clay, silty clay loam.	MH, CL, CH	A–6, A–7
			48–78	Silt loam, silty clay loam, clay loam.	ML, CL, SC	A–4, A–6
Whiteford: WhB, WhC2	3–5	>4	0–10	Silt loam	ML	A–4
			10–37	Silty clay loam, slaty silty clay loam, silty loam.	ML, CL	A–4, A–6
			37–39	Slaty silty clay loam, very slaty silt loam.	GM, GC, ML, CL	A–2, A–4, A–6
			39	Slate bedrock.		
Woodstown: WoB	>10	1½–2½	0–9	Sandy loam, loam	SM, SC, ML	A–2, A–4
			9–34	Sandy clay loam, loam, sandy loam.	SM, SC, ML, CL	A–2, A–4, A–6
			34–60	Sandy loam, loamy sand, sand.	SM, SP-SM	A–1, A–2

[1] Depths shown are for the representative profile (see soil descriptions). For any given layer, the figures are estimates based on the range of the series within the Harford County Area.

expressed in pH values. The pH value and terms used to describe soil reaction are defined in the Glossary.

Shrink-swell potential indicates the relative change in volume that occurs in soil material with a change in moisture content; that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Engineering interpretations

The estimated interpretations in table 8 are based on the estimated engineering properties of soils shown in table 7, on test data for soils in nearby or adjoining survey areas, and on the experience of engineers and soil scientists with the soils of the Harford County Area. In table 8, ratings summarize the limitation or suitability of the soils for the given purposes. The table also lists those soil features to be considered in planning, installing, and maintaining drainage of cropland and pasture, irrigation, ponds and reservoirs, embankments, and terraces and diversions.

Soil suitability is rated by the terms *good, fair*, and *poor*, which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or the response of plants when fertilizer is applied; and absence of substance toxic to plants. Also, texture of the soil material and its content of stone fragments affect suitability. Also considered in the ratings is damage that results to the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance in where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials. Also, they do not indicate the quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil that has been placed in an embankment that has been properly compacted and provided with adequate drainage, and (2) the relative ease of excavating the material at borrow areas.

Soil properties that most affect highway and road location are load supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth over hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Soils suitable for pond reservoir areas (fig. 13, page 92) have

significant in engineering—Continued

Coarse fraction greater than 3 inches	Percentage passing sieve—				Permeability range	Available water capacity	Reaction (unlimed)	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
Pct					*In per hr*	*In per in of soil*	*pH*	
0–5	85–100	80–100	70–100	60–100	0.2–2.0	0.14–0.28	4.5–6.5	Low.
0–5	80–100	75–100	70–100	65–100	<0.2	0.10–0.24	5.0–7.3	Moderate.
0–10	75–100	70–100	50–100	40–100	0.2–2.0	0.12–0.24	5.5–7.3	Moderate.
0–5	80–100	75–100	70–90	55–85	0.6–2.0	0.12–0.24	4.5–5.5	Low.
0–25	80–100	75–100	70–95	65–90	0.6–2.0	0.10–0.24	4.5–5.5	Low to moderate.
25–50	40–80	30–70	25–55	15–55	0.6–6.0	0.07–0.18	4.5–5.5	Low.
0	90–100	90–100	45–100	15–75	0.6–6.0	0.08–0.24	4.0–5.0	Low.
0	95–100	90–100	70–100	25–75	0.6–2.0	0.10–0.24	4.0–5.0	Low.
0	60–100	55–100	40–90	5–30	0.6–6.0	0.06–0.12	4.0–5.0	Low.

[2] Thickness of layer is too variable to be estimated. In general, the top layer ranges from 2 or 3 inches to 3 or 4 feet, and the next layer extends to a depth of 5 feet or more.

low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Pond embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Stones and organic material in a soil are among factors that are unfavorable.

Drainage of cultivated land and pasture is affected by such soil properties as permeability, texture, and structure; depth over claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope and stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Sprinkler irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and seepage so that they soak into the soil or flow slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth over bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Grassed waterway layout and construction are affected by such soil properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and the steepness of slopes. Other factors affecting waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil in building roads if temperatures are below freezing.

Pipeline construction and maintenance is influenced by the natural in-place stability of the soil, by height and seasonal fluctuation of the water table, by depth over bedrock, and by the potential of the soil to corrode pipes.

Town and Country Planning

The Harford County Area, located in the heavily populated metropolitan corridor, is rapidly increasing in population. Farmland and woodland are rapidly decreasing as residential, commercial, industrial, and recreational facilities are developed. The soil survey is an effective tool in comprehensive residential, commercial, industrial, and recreational planning.

This section describes residential and related uses of the soils and in table 9 shows the degree and kind of limitation for specified uses for each soil mapped in the county. It explains the use of soils for sanitary landfills and in table 10 shows the degree and kind of limitation for trench-type landfills, area-type landfills, and cover material in all soils of the survey area. It also decribes the use of soils for

TABLE 8.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in

Soil series and map symbols	Suitability as source of —			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Aldino: AdA, AdB, AdC, AsB	Fair to a depth of 10 inches.	Unsuitable: none present.	Fair: A–4, A–5, A–6; in places some A–2 material in substrata.	Seasonal perched water table at a depth of 1½ to 2½ feet; high potential frost action.	Seasonal perched water table at a depth of 1½ to 2½ feet; bedrock at a depth of 3½ to 6 feet.
Alluvial land: Av. No interpretations; material too variable.					
Baile: BaA, BaB	Fair to a depth of 9 inches; seasonal high water table within a depth of 1 foot.	Unsuitable: too many fines.	Poor: A–6, A–7; low to moderate shrink-swell potential.	Seasonal high water table within a depth of 1 foot; seepage from higher areas; high potential frost action.	Seasonal high water table within a depth of 1 foot.
Beltsville: BeA, BeB, BeC	Fair	Unsuitable: loamy material.	Poor to fair: A–6, A–2.	Seasonal perched water table at a depth of 1½ to 2½ feet; high potential frost action; seepage problem in cuts; cuts and fills needed.	Slow seepage in fragipan; variable seepage in substratum.
Brandywine: BrC2, BrD3, BrE3	Fair to a depth of 10 inches; some coarse fragments locally.	Poor to unsuitable; variable amounts of coarse sandy material in substratum.	Good: A–2, A–3, A–4.	Bedrock at a depth of 4 to 10 feet; low to moderate potential frost action; cuts and fills needed.	Pervious materials.
Chester: CcA, CcB2, CcC2, CgB2, CgC2, CgD2.	Good to a depth of 12 inches except for gravelly and channery phases.	Unsuitable: no sand present; some gravel in surface layer.	Fair to good: A–6, A–5, A–4, A–2; mica content increases below a depth of 3 feet.	Substratum has high mica content; stones in places; moderate potential frost action; cuts and fills needed.	Pervious substratum.
*Chillum: ChB2, CkC2. For Neshaminy part of CkC2, see Neshaminy series.	Good except for some gravel locally.	Unsuitable to a depth of 28 inches, locally fair below.	Fair above a depth of 28 inches, good below; A–4, A–6, A–2.	Low to moderate potential frost action; cuts and fills needed.	Pervious substratum.
Chrome: CrE	Poor: low productivity.	Unsuitable: too many fines.	Poor: A–7; moderate to high shrink-swell potential; in places some A–2 materials below a depth of 1½ feet.	Bedrock at a depth of 1½ to 3⅓ feet; moderate potential frost action.	Moderate permeability; bedrock at depth of 1½ to 3⅓ feet.

interpretations

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to the first column of this table]

Soil features affecting—Continued						
Ponds—Continued						
Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Poor to fair stability and compaction; fair to poor resistance to piping.	Seasonal perched water table at a depth of 1½ to 2½ feet; slow permeability.	Moderate intake rate and moderate available water capacity.	Seasonal perched water table at a depth of 1½ to 2½ feet; bedrock at a depth of 3½ to 6 feet.	Moderate available water capacity.	Seasonal perched water table at a depth 1½ to 2½ feet; poor trafficability; high silt content.	Seasonal perched water table at a depth of ½ to 2½ feet; bedrock at a depth of 3½ to 6 feet.
Fair to poor stability; fair to very poor compaction; fair resistance to piping.	Seasonal high water table within a depth of 1 foot; moderately slow to slow permeability.	Drainage needed; seasonal high water table within a depth of 1 foot; moderately slow to slow permeability.	Not needed on this soil.	Seasonal high water table within a depth of 1 foot; seepage from higher areas.	Seasonal high water table within a depth of 1 foot; very poor trafficability.	Seasonal high water table within a depth of 1 foot; seepage from higher areas.
Fair stability and compaction; fair to poor resistance to piping.	Seasonal perched water table; slow permeability; fragipan.	Drainage needed; moderate available water capacity; moderate intake rate; slow permeability.	Seepage above fragipan; fair stability; highly erodible; low fertility.	Seepage above fragipan; moderate available water capacity; highly erodible.	Poor trafficability; seasonal perched water table at a depth of 1½ to 2½ feet.	Seasonal perched water table at a depth of 1½ to 2½ feet; seepage plane at a depth of 2 to 3 feet; trenches subject to caving.
Fair to poor stability and compaction; poor resistance to piping.	Not needed; well drained.	Moderate to moderately rapid intake rate; low available water capacity.	Fair to poor stability.	Low available water capacity.	Fair to good trafficability.	Bedrock at a depth of 4 to 10 feet.
Fair stability and compaction; substratum micaceous; fair to poor resistance to piping.	Not needed; well drained.	Moderate intake rate; high available water capacity.	Fair stability	High available water capacity.	Fair trafficability.	Stones in places.
Fair stability; fair to good compaction; fair resistance to piping.	Not needed; well drained.	Moderate intake rate; moderate permeability; moderate available water capacity.	Features generally favorable.	Features generally favorable.	Good trafficability.	Features generally favorable.
Fair to poor stability and compaction; limited borrow material; fair to good resistance to piping.	Not needed; well drained.	Moderate intake rate; low to moderate available water capacity.	Fair to poor stability; bedrock at a depth of 1½ to 3⅓ feet.	Low to moderate available water capacity.	Fair to poor trafficability; plastic materials.	Plastic materials; bedrock at a depth of 1½ to 3⅓ feet.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Codorus: Cu	Fair to depth of more than 18 inches; seasonal high water table at a depth of 2 feet.	Poor to unsuitable; deep overburden if present; limited quantity.	Poor: A–6, A–5, A–4; low to moderate shrink-swell potential.	Seasonal high water table at a depth of 1½ to 2 feet; flooding hazard; high potential frost action.	Seasonal high water table at a depth of 1½ to 2 feet; pervious substratum.
Comus: Cv	Good to a depth of 35 inches.	Unsuitable: locally small amounts of sand below a depth of 42 inches.	Fair to poor: A–4, A–6; underlying materials variable, A–2, A–4, A–6.	Subject to flooding; moderate to high potential frost action.	Pervious substratum; flooding hazard.
Cut and fill land: Cx. No interpretations; material too variable.					
Delanco: DcA, DcB	Fair to a depth of 11 inches; ponding in places.	Unsuitable: none present.	Fair to poor: A–4, A–6, A–7; low to moderate shrink-swell potential.	Seasonal high water table at a depth of 1½ to 2 feet; high potential frost action.	Seasonal high water table at a depth of 1½ to 2 feet; seepage losses in variable substratum.
Elioak: EhB2, EhC2	Good to a depth of 12 inches.	Unsuitable: none present.	Poor: A–4, A–6, A–7; moderate shrink-swell potential; mica content increases with increasing depth.	Soft micaceous substratum at a depth of about 3 feet extending to depths of more than 10 feet; moderate potential frost action; cuts and fills needed.	Pervious substratum.
Elkton: En	Poor to fair to a depth of 10 inches.	Unsuitable	Poor: A–6, A–7, A–2; low to moderate shrink-swell material.	Seasonal high water table within a depth of 1 foot; high potential frost action; plastic; local ponding.	Seasonal high water table within a depth of 1 foot; impervious materials.
Elsinboro: EsA, EsB2, EsC2	Good	Unsuitable to a depth of 3 feet, locally fair below.	Fair to good: A–4, A–6, A–2.	Moderate potential frost action.	Moderate seepage in subsoil; pervious substratum.
Evesboro: EvC	Poor: sandy material.	Good to fair for sand; locally good to fair for gravel.	Good if soil binder is added; A–1, A–2, A–3.	Loose sand; hauling hindered; subject to soil blowing; cuts and fills needed; cuts are droughty and vegetation is difficult to establish.	Excessive seepage.

interpretations—Continued

Soil features affecting—Continued						
Ponds—Continued						
Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Fair to poor stability and compaction; fair to poor resistance to piping.	Seasonal high water table at a depth of 1½ to 2 feet; flooding hazard; outlet problem.	Seasonal high water table at a depth of 1½ to 2 feet; moderate intake rate; flooding hazard.	Not needed on this soil.	Seasonal high water table at a depth of 1½ to 2 feet; flooding hazard.	Poor to very poor trafficability; flooding hazard; seasonal high water table at a depth of 1½ to 2 feet.	Seasonal high water table at a depth of 1½ to 2 feet; flooding hazard; caving hazard.
Fair to poor stability and compaction; poor resistance to piping.	Not needed; well drained.	Moderate intake rate; high available water capacity.	Not needed on this soil.	High available water capacity and fertility.	Fair to poor trafficability; flooding hazard.	Flooding hazard.
Fair to poor stability and compaction; fair resistance to piping.	Seasonal high water table at a depth of 1½ to 2 feet; moderately slow permeability.	Moderate intake rate; moderately slow permeability.	Fair to poor stability.	High available water capacity; moderate fertility.	Fair trafficability; seasonal high water table at a depth of 1½ to 2 feet.	Seasonal high water table at a depth of 1½ to 2 feet.
Fair to poor stability and compaction; fair to good resistance to piping.	Not needed; well drained.	Moderate intake rate and permeability; high available water capacity.	Fair to poor stability; erodible.	High available water capacity and fertility.	Fair trafficability; plastic when wet.	Deeply weathered micaceous substratum; plastic subsoil in places.
Plastic materials; poor stability; poor to fair compaction; moderate to high compressibility; good resistance to piping.	Seasonal high water table within a depth of 1 foot; slow permeability.	Drainage needed; slow intake rate; slow permeability; high available water capacity.	Poor stability; plastic material; difficult to establish vegetation; seasonal high water table within a depth of 1 foot.	Seasonal high water table within a depth of 1 foot; plastic materials; difficult to establish vegetation.	Very poor trafficability; seasonal high water table within a depth of 1 foot; plastic materials.	Seasonal high water table within a depth of 1 foot; poor stability; plastic materials.
Fair stability; fair to good compaction; fair to good resistance to piping.	Not needed; well drained.	Moderate intake rate; moderate permeability; high available water capacity.	Features generally favorable.	Features generally favorable.	Good trafficability.	Features generally favorable.
Fair stability; fair to good compaction; poor resistance to piping; porous sandy material.	Not needed; well drained.	Very high intake rate; rapid permeability; very low available water capacity.	Fair stability; loose sand subject to soil blowing; low fertility; droughty.	Very low available water capacity; low fertility.	Features generally favorable.	Trenches subject to caving.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Fallsington: Fs	Fair: seasonal high water table within a depth of 1 foot.	Fair for sand below a depth of 30 inches; unsuitable for gravel.	Good to fair: A–2, A–4, A–3.	Seasonal high water table within a depth of 1 foot; high potential frost action; running sand substratum; local ponding.	Seasonal high water table within a depth of 1 foot; moderate seepage in subsoil; pervious substratum.
Glenelg: GcB2, GcC2, GcC3, GcD2, GcD3, GgB2, GgC2, GgC3, GgD2, GgD3.	Fair to a depth of 8 inches; coarse fragments in places.	Unsuitable: none present.	Poor to fair: A–4, A–5, A–6; mica content increases with increasing depth.	Highly micaceous substratum; moderate potential frost action; cuts and fills needed.	Seepage in pervious substratum.
Glenville: GnA, GnB	Fair to a depth of 9 inches; seasonal high water table at a depth of 1 to 3 feet.	Unsuitable: none present.	Fair to poor: A–4, A–6.	Seasonal high water table at a depth of 1 to 3 feet; high potential frost action.	Seasonal high water table at a depth of 1 to 3 feet; seepage in substratum.
Hatboro: Hb	Fair to a depth of 9 inches; seasonal high water table within a depth of 1 foot.	Unsuitable: locally fair below a depth of 4½ feet in places.	Poor: A–4, A–6, A–7; locally underlain by stratified A–1, A–2 material.	Seasonal high water table within a depth of 1 foot; high potential frost action; flooding hazard.	Seasonal high water table within a depth of 1 foot; flooding hazard; stratified and variable materials in substratum.
Joppa: JpB, JpC	Fair to poor: coarse materials.	Good: excessive fines locally.	Good: A–1, A–2, A–4.	Features are favorable except for the need for cuts and fills.	Excessive seepage.
Kelly: KeB, KeC2, KfD	Fair to poor to a depth of 6 to 8 inches; seasonal high water table at a depth of 1 to 2 feet.	Unsuitable: none present.	Poor: A–6, A–7; high shrink-swell potential; very plastic clay materials.	Seasonal high water table at a depth of 1 to 2 feet; very plastic; moderate to high shrink-swell potential; clays; bedrock at a depth of 3½ to 5 feet; moderate to high potential frost action.	Seasonal high water table at a depth of 1 to 2 feet; slow permeability; bedrock at a depth of 3½ to 5 feet.
Keyport: KpA, KpB	Fair to a depth of 8 inches.	Unsuitable	Poor: A–4, A–6, A–7; moderate to high shrink-swell potential.	Seasonal high water table at a depth of 1½ to 3 feet; high potential frost action; plastic materials.	Seasonal high water table at a depth of 1½ to 3 feet; slow permeability.

interpretations—Continued

Soil features affecting—Continued						
Ponds—Continued						
Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Fair stability; fair to good compaction; poor resistance to piping.	Seasonal high water table within a depth of 1 foot; moderate permeability; running sand in substratum.	Drainage needed; moderate intake rate; moderate permeability; high available water capacity.	Not needed on this soil.	Seasonal high water table within a depth of 1 foot; high available water capacity.	Poor trafficability; seasonal high water table within a depth of 1 foot.	Seasonal high water table within a depth of 1 foot; trenches subject to caving; running sand in substratum.
Fair stability and compaction; fair to poor resistance to piping.	Not needed; well drained.	Moderate intake rate and permeability; high available water capacity.	Fair stability; erodible.	High available water capacity.	Fair trafficability.	Bedrock at a depth of 4 to 10 feet.
Fair stability and fair to good compaction; fair resistance to piping.	Seasonal high water table at a depth of 1 to 3 feet; moderately slow permeability.	Moderate intake rate; moderately slow permeability; seasonal high water table.	Not needed on this soil.	Moderate available water capacity; seasonal high water table.	Fair to poor trafficability; seasonal high water table.	Seasonal high water table at a depth of 1 to 3 feet; bedrock at a depth of 4 to 6 feet.
Fair to poor stability; fair compaction; fair resistance to piping.	Seasonal high water table within a depth of 1 foot; flooding hazard; outlets difficult to obtain.	Not needed on this soil.	Not needed on this soil.	Seasonal high water table within a depth of 1 foot; flooding hazard.	Poor trafficability; seasonal high water table within a depth of 1 foot; flooding hazard.	Seasonal high water table within a depth of 1 foot; flooding hazard.
Good stability and good to fair compaction; fair to good resistance to piping.	Not needed; well drained.	High intake rate; moderately rapid permeability; low available water capacity.	Good stability	Low available water capacity.	Good trafficability.	Features generally favorable.
Poor stability and compaction; moderate to high shrink-swell potential; good resistance to piping.	Slow permeability; plastic subsoil; seasonal high water table at a depth of 1 to 2 feet.	Moderate intake rate; slow permeability.	Poor stability; very plastic clay materials; erodible.	Seasonal high water table at a depth of 1 to 2 feet; low fertility.	Poor trafficability; very plastic clays; moderate to high shrink-swell potential; seasonal high water table at a depth of 1 to 2 feet.	Very plastic clays; seasonal high water table at a depth of 1 to 2 feet; bedrock at a depth of 3½ to 5 feet.
Plastic materials; poor stability; poor to fair compaction; moderate to high compressibility; good resistance to piping.	Seasonal high water table at a depth of 1½ to 3 feet; slow permeability.	Moderate intake rate; slow permeability; high available water capacity.	Poor stability; plastic materials difficult to establish vegetation; seasonal high water table at a depth of 1½ to 3 feet.	Plastic materials; vegetation difficult to establish.	Poor trafficability; plastic clays; seasonal high water table at a depth of 1½ to 3 feet.	Plastic clays; seasonal high water table at a depth of 1½ to 3 feet; bedrock at a depth of more than 10 feet.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Kinkora: KrA, KrB	Poor to fair to a depth of 10 inches.	Unsuitable	Poor: A–6, A–7, A–4; moderate to high shrink-swell potential.	Seasonal high water table within a depth of 1 foot; high potential frost action; plastic materials.	Seasonal high water table within a depth of 1 foot; seepage unlikely or slow.
Legore: LeB2, LeC2, LeD2, LeE, LfC, LfD, LfE, LgC3, LgD3.	Fair to poor: variable gravel content.	Poor: excessive fines.	Fair to poor: A–4, A–6, A–7, underlain at a depth of about 2 feet by A–2, or A–6 material; low to moderate shrink-swell potential.	Bedrock at a depth of more than 4 feet; low to moderate potential frost action; cuts and fills needed.	Moderate permeability; substratum has moderately rapid permeability; in places bedrock at depth of more than 4 feet.
Leonardtown: Lr	Poor to fair: perched high water table within a depth of 1 foot.	Unsuitable: loamy materials.	Poor to fair: A–4, A–6, A–2.	Perched water table within a depth of 1 foot; high potential frost action; seepage problems in cuts.	Perched water table within a depth of 1 foot; seepage unlikely in upper 5 feet depth; slow to moderate seepage below a depth of 5 feet.
Loamy and clayey land: LyB, LyD, LyE.	Fair above clay layer.	Unsuitable	Very poor: mostly A–7.	Cut slopes are unstable, and vegetation is difficult to establish; plastic materials.	Plastic; slowly permeable.
*Manor: MbB2, MbC2, MbC3, MbD2, MbD3, McB2, McC2, McC3, McD2, McD3, MdE, MfE, MgC, MgD. For Glenelg part of MgC and MgD, see Glenelg series.	Good	Unsuitable: excessive fine material.	Fair to poor: A–4, A–5 mica content increases with increasing depth.	Substratum usually strongly weathered micaceous material; moderate potential frost action; cuts and fills needed.	High seepage in permeable substratum.
Matapeake: MkA, MkB	Good	Unsuitable for gravel; fair to poor for sand below a depth of 3 to 5 feet, unsuitable above this depth.	Fair above a depth of 3 to 5 feet; A–4, A–6; fair to good below a depth of 3 to 5 feet; A–2, A–4, A–6.	Moderate potential frost action; cuts and fills needed.	Moderate seepage above a depth of 3 to 5 feet; rapid seepage below this depth.
Mattapex: MlA, MlB	Good	Unsuitable for gravel; fair to poor for sand below a depth of 3 to 5 feet; unsuitable above this depth.	Fair above a depth of 3 to 5 feet; A–4, A–6; fair to good below a depth of 3 to 5 feet; A–2, A–4, A–6.	Seasonal high water table at a depth of 1½ to 2½ feet; high potential frost action.	Seasonal high water table at a depth of 1½ to 2½ feet; moderate to moderately slow seepage at a depth of 3 to 5 feet; rapid seepage below this depth.

interpretations—Continued

Soil features affecting—Continued						
Ponds—Continued						
Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Fair to poor stability and compaction; medium to high compressibility; good resistance to piping; subject to cracking.	Seasonal high water table within a depth of 1 foot; slow permeability.	Drainage needed; moderate to slow intake rate; slow permeability; high available water capacity.	Poor stability; seepage in spots; plastic materials; vegetation difficult to establish.	Plastic materials; vegetation difficult to establish.	Poor trafficability; seasonal high water table within a depth of 1 foot; plastic materials.	Seasonal high water table within a depth of 1 foot; plastic materials; fair to poor stability; subject to seepage.
Fair to good stability and compaction; fair to poor resistance to piping.	Not needed; well drained.	Moderately rapid to moderately slow intake rate; variable gravel content; high available water capacity.	Fair to good stability; variable gravel content; erodible.	Erodible on moderate slopes.	Poor trafficability; variable gravel content.	Variable gravel content; bedrock at a depth of more than 4 feet.
Poor to fair stability and compaction; fair resistance to piping.	Perched water table above fragipan; slow permeability.	Drainage needed; moderately slow intake rate; slow permeability; moderate available water capacity; fragipan limits rooting depth.	Perched water table within a depth of 1 foot; seepage above fragipan; poor to fair stability.	Perched water table within a depth of 1 foot; seepage above fragipan; highly erodible; low fertility.	Poor to fair trafficability; perched water table within a depth of 1 foot.	Perched water table within a depth of 1 foot; seepage above fragipan; cuts unstable in places.
Very poor stability; poor compaction; variable resistance to piping; highly erodible.	Not needed; well drained.	Variable intake rate; slow permeability; high available water capacity.	Very poor stability; plastic materials; vegetation difficult to establish.	Plastic materials; vegetation difficult to establish.	Poor trafficability; plastic materials.	Plastic materials; trenches cave if wet.
Fair to poor stability and compaction; poor resistance to piping.	Not needed; well drained.	Moderate intake rate; moderate available water capacity.	Fair to poor stability; erodible; stone.	Moderate available water capacity; erodible; stone.	Fair trafficability; substratum micaceous; stones.	All features are favorable.
Fair stability; fair to good compaction; fair to poor resistance to piping.	Not needed; well drained.	Moderate intake rate; moderate permeability; high available water capacity.	Features generally favorable.	Features generally favorable.	Fair trafficability; plastic materials in places.	Features generally favorable.
Fair stability; fair to good compaction; fair to good resistance to piping.	Seasonal high water table at a depth of 1½ to 2½ feet; moderately slow permeability.	Drainage needed; moderate intake rate; moderately slow permeability; high available water capacity.	Fair stability	Seasonal high water table at a depth of 1½ to 2½ feet.	Poor trafficability; seasonal water table at a depth of 1½ to 2½ feet.	Seasonal water table at a depth of 1½ to 2½ feet.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Montalto: MsA, MsB2, MsC2	Fair to a depth of 10 inches.	Unsuitable: none present.	Poor to fair; A–6, A–7; moderate to high shrink-swell potential; sticky, plastic; stones.	Bedrock at a depth of 5 to 12 feet; moderate potential frost action; cuts and fills needed.	Bedrock at a depth of 5 to 12 feet; seepage in substratum.
*Neshaminy: NeA, NeB2, NeC2, NsC, NsD, NsE. For Montalto part of NsC, NsD, and NsE, see Montalto series.	Good to a depth of 14 inches; stones present in places.	Unsuitable: none present.	Fair: A–2, A–4, A–6; low to moderate shrink-swell potential.	Bedrock at a depth of 4 to 10 feet; moderate potential frost action; cuts and fills needed.	Bedrock at a depth of 4 to 10 feet; seepage losses in places; moderate permeability.
Othello: Ot	Fair: seasonal high water table within a depth of 1 foot.	Fair for sand below a depth of 3 feet; unsuitable for gravel.	Fair: A–4, A–6, A–2.	Seasonal high water table within a depth of 1 foot; high potential frost action; local ponding.	Seasonal high water table within a depth of 1 foot; moderately slow seepage in subsoil; rapid seepage in substratum.
Sand and gravel pits: Sa. No interpretations; material too variable.					
*Sassafras: ShB2, ShC2, SlB2, SlC2, SsD, SsE. For Joppa part of SsD and SsE, see Joppa series.	Good	Fair for sand and locally fair for gravel below a depth of 3 feet.	Good: A–2, A–4, A–1, A–6.	Features are favorable except for the need for cuts and fills.	Moderate seepage in subsoil; rapid seepage in substratum.
Stony land, steep: St. No interpretations; material too variable.					
Swamp: Sw. No interpretations; material too variable.					
Tidal marsh: Tm. No interpretations; material too variable.					
Watchung: WaA, WaB, WcB	Fair to a depth of 9 inches; seasonal high water table within a depth of 1 foot.	Unsuitable: none present.	Poor: A–6, A–7, A–4; moderate shrink-swell potential.	Seasonal high water table within a depth of 1 foot; bedrock at a depth of 5 to 10 feet; high potential frost action.	Seasonal high water table within a depth of 1 foot; bedrock at a depth of 5 to 10 feet.
Whiteford: WhB, WhC2	Good to a depth of 10 inches.	Unsuitable	Fair to good: A–6, A–5, A–4, A–2.	Bedrock at a depth of 3 to 5 feet; slate fragments in places; cuts and fills needed.	Moderate permeability; bedrock at a depth of 3 to 5 feet.

interpretations—Continued

Soil features affecting—Continued						
Ponds—Continued Embankment	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Fair to poor stability and compaction; fair to good resistance to piping; stones.	Not needed; well drained.	Moderate intake rate; moderately slow permeability; high available water capacity.	Fair to poor stability; erodible; stones.	High available water capacity.	Poor trafficability; sticky, plastic; stones.	Bedrock at a depth of 5 to 12 feet; sticky and plastic material; stones.
Fair stability and compaction; fair resistance to piping; stones.	Not needed; well drained.	Moderate intake rate; moderate permeability.	Fair stability; stones.	High available water capacity; stones.	Fair trafficability; stones.	Bedrock at a depth of 4 to 10 feet; stones.
Fair stability; fair to good compaction; fair to poor resistance to piping.	Seasonal high water table within a depth of 1 foot; moderately slow permeability.	Drainage needed; moderate intake rate; moderately slow permeability; high available water capacity; running sand substratum.	Not needed on this soil.	Seasonal high water table within a depth of 1 foot.	Poor trafficability; seasonal high water table within a depth of 1 foot.	Seasonal high water table within a depth of 1 foot; running sand substratum; caving hazard.
Good stability and compaction; fair to poor resistance to piping.	Not needed; well drained.	Moderate to moderately rapid intake rate; moderate permeability; moderate to high available water capacity.	Features generally favorable.	Features generally favorable.	Good trafficability.	Features generally favorable.
Fair to poor stability and compaction; good resistance to piping.	Seasonal high water table within a depth of 1 foot; slow permeability.	Seasonal high water table within a depth of 1 foot; slow permeability.	Not needed on this soil.	Seasonal high water table within a depth of 1 foot.	Poor trafficability; plastic material; seasonal high water table within a depth of 1 foot.	Seasonal high water table within a depth of 1 foot; bedrock at a depth of 5 to 10 feet; plastic materials.
Fair stability and compaction; fair to poor resistance to piping.	Not needed; well drained.	Moderate intake rate; high available water capacity.	Fair stability; erodible.	High available water capacity.	Fair trafficability.	Bedrock at a depth of 3 to 5 feet.

TABLE 8.—*Engineering*

Soil series and map symbols	Suitability as source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds: Reservoir area
Woodstown: WoB	Good	Fair for sand; unsuitable for gravel.	Fair to good: A–2, A–4, A–6.	Seasonal high water table at a depth of 1½ to 2½ feet; high potential frost action.	Seasonal high water table at a depth of 1½ to 2½ feet; moderate seepage in subsoil; rapid seepage in substratum.

several recreational activities and in table 11 shows the limitations of each soil for specified recreational uses.

Community planning

Table 9 provides information on the properties of the soils and their effect on selected nonfarm uses. This information helps community planners, developers, and individual landowners to determine the most suitable use for a particular area. Other useful information can be found in other parts of the survey, particularly in the section "Descriptions of the Soils" and the section "Engineering Uses of the Soils." Although the soil maps and tables serve as a guide and can eliminate a site from further consideration, they do not eliminate the need for direct detailed onsite investigation. Not considered in this section are location, in relation to established business centers or transportation lines, and other

***Figure 13.*—Farm pond in an area of mostly Neshaminy and Glenelg soils.**

interpretations—Continued

Soil features affecting—Continued						
Ponds—Continued	Drainage	Sprinkler irrigation	Terraces or diversions	Grassed waterways	Winter grading	Pipeline construction and maintenance
Embankment						
Good stability and compaction; fair to poor resistance to piping.	Seasonal high water table at a depth of 1½ to 2½ feet; moderate permeability; ditch banks subject to caving.	Drainage needed; moderate to moderately rapid intake rate; moderate permeability; moderate available water capacity.	Features generally favorable.	Features generally favorable.	Fair trafficability; seasonal high water table at a depth of 1½ to 2½ feet.	Seasonal high water table at a depth of 1½ to 2½ feet; trenches subject to caving.

economic factors that are important and often determine the ultimate use of an area.

Table 9 shows the estimated degree and kinds of limitation for selected uses. The degree of limitation is expressed as slight, moderate, or severe. The soil characteristic of the highest degree of limitation is used to rate the soil. If the rating is *moderate* or *severe*, the main limiting property or properties are given. The ratings are based on the degree of the greatest single limitation. For example, if flooding severely limits the use of a soil in the disposal of sewage effluent from septic tanks, the limitation is rated *severe*, though the soil is well suited to that use in all other respects.

A rating of *slight* indicates that the soil has properties favorable for the rated use, and soil limitations are minor and can be easily overcome. Good performance and low maintenance can be expected on the soil.

A rating of *moderate* indicates that the soil has properties moderately favorable for the rated use. The limitations can be overcome or modified with special planning, design, or maintenance. During some seasons of the year, the performance of the structure or other planned use may be somewhat less desirable than for soils with a slight limitation.

A rating of *severe* indicates that the soil has one or more unfavorable properties for the rated use. Limitations are difficult and costly to modify or overcome, and require major soil reclamation, special design, or intense maintenance. Some soils rated *severe* can be improved by reducing or removing the soil feature that limits its use. In most situations it is difficult and costly to alter the soil or design a structure to compensate for soil limitations that are severe.

A rating of *very severe* indicates that the soil has one or more soil features so unfavorable for the particular use that to overcome the limitation is very difficult and expensive. Reclamation is extremely difficult requiring the soil material to be removed, replaced, or completely modified. For the most part, these soils are not used for the purpose rated.

Septic tank filter fields, as rated in table 9, are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material is rated from a depth of 18 inches to 6 feet. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or bedrock, and susceptibility to flooding. Slope affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage at a depth within 2 to 5 feet of the surface long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides, or embankments, of compacted soil material. The embankment is assumably compacted to medium density, and the pond is protected from flooding. The properties considered are those that affect the pond floor and the embankment. These are permeability, organic-matter content, and slope. If the floor needs leveling, depth to bedrock and the kind of bedrock are important. The soil properties that affect the embankment are the properties of the embankment material, as interpreted from the Unified Soil Classification, and the number of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Homesites, as rated in table 9, are no more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

The cost of constructing and maintaining streets and parking lots is determined by soil properties at the site. A seasonal high water table delays construction work. Drainage is required and expensive fill material is needed to make a durable street or parking lot. A steep slope requires an increased cut and fill. Hard bedrock in places substantially increases construction costs. Stoniness and the flood hazard are also important.

The productivity of home gardens is based on depth to the seasonal high water table, slope, depth over bedrock, stoniness, soil texture, and flood hazard.

Sanitary landfill

Sanitary landfill is a method of disposing of refuse. The waste is spread in thin layers, compacted, and covered with

TABLE 9.—*Degree and kind of limitation to*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in

Soil series and map symbols	Sewage disposal	
	Filter fields	Lagoons
Aldino:		
AdA	Severe: slow permeability; seasonally perched water table.	Slight
AdB	Severe: slow permeability; seasonally perched water table.	Moderate: slope
AdC	Severe: slow permeability; seasonally perched water table.	Severe: slope
AsB	Severe: slow permeability; seasonally perched water table.	Moderate: slope
Alluvial land: Av	Severe: high water table; flood hazard [1]	Severe: flood hazard [1]
Baile:		
BaA	Severe: high water table; poor natural drainage; moderately slow to slow permeability.	Slight
BaB	Severe: high water table; poor natural drainage; moderately slow to slow permeability.	Moderate: slope
Beltsville:		
BeA	Severe: slow permeability; seasonally perched water table.	Slight
BeB	Severe: slow permeability; seasonally perched water table.	Moderate: slope
BeC	Severe: slow permeability; seasonally perched water table.	Severe: slope
Brandywine:		
BrC2	Moderate: slope [1]	Severe: moderately rapidly permeable; slope [1]
BrD3, BrE3	Severe: slope [1]	Severe: moderately rapidly permeable; slope [1]
Chester:		
CcA	Slight	Moderate: moderate permeability
CcB2, CgB2	Slight	Moderate: moderate permeability; slope
CcC2, CgC2	Moderate: slope	Severe: slope; moderate permeability
CgD2	Severe: slope	Severe: slope; moderate permeability
*Chillum:		
ChB2	Moderate: moderate permeability	Moderate: moderate permeability; slope
CkC2	Moderate: moderate permeability	Severe: slope; moderate permeability
For Neshaminy part of CkC2, see Neshaminy series.		
Chrome: CrE	Severe: less than 4 feet deep over bedrock; slope.	Severe: less than 4 feet deep over bedrock; slope.
Codorus: Cu	Severe: moderately high water table; flood hazard.[1]	Severe: flood hazard [1]
Comus: Cv	Severe: flood hazard [1]	Severe: flood hazard [1]
Cut and fill land: Cx. Unsuited to these uses; material too variable.		

See footnote at end of table.

be considered in town and country planning

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to the first column of this table]

Homesites (three stories or less)		Streets and parking lots	Home gardens
With basements	Without basements		
Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table.	Moderate: seasonally perched water table.
Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table; slope.	Moderate: slope; seasonally perched water table.
Moderate: seasonally perched water table; slope.	Moderate: slope	Severe: slope; seasonally perched water table.	Severe: slope; seasonally perched water table.
Moderate: seasonally perched water table; stoniness.	Slight	Moderate: seasonally perched water table; stoniness.	Severe: stoniness.
Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table.	Moderate: seasonally perched water table.
Moderate: seasonally perched water table.	Slight	Moderate: seasonally perched water table; slope.	Moderate: slope; seasonally perched water table.
Moderate: seasonally perched water table.	Slight	Severe: slope	Severe: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Slight	Slight	Moderate: slope	Moderate: slope.
Slight	Slight	Severe: slope	Severe: slope.
Severe: less than 4 feet deep over rippable bedrock; slope.	Severe: slope	Severe: less than 4 feet deep over rippable bedrock; slope.	Severe: slope; less than 4 feet deep over bedrock; severely eroded.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Moderate: moderately high water table; flood hazard.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: slight if protected from flooding.

TABLE 9.—*Degree and kind of limitation to be*

Soil series and map symbols	Sewage disposal	
	Filter fields	Lagoons
Delanco:		
DcA	Severe: moderately slow permeability	Slight
DcB	Severe: moderately slow permeability	Moderate: slope
Elioak:		
EhB2	Slight	Moderate: moderate permeability
EhC2	Moderate: slope	Severe: slope; moderate permeability
Elkton: En	Severe: high water table; poor natural drainage; slow permeability.	Slight
Elsinboro:		
EsA	Slight	Moderate: moderate permeability
EsB2	Slight	Moderate: moderate permeability; slope
EsC2	Slight	Severe: slope; moderate permeability
Evesboro: EvC	Slight [1] to moderate: slope	Severe: rapidly permeable; slope [1]
Fallsington: Fs	Severe: high water table; poor natural drainage.	Moderate: moderate permeability
Glenelg:		
GcB2, GgB2	Slight	Moderate: moderate permeability; slope
GcC2, GcC3, GgC2, GgC3	Moderate: slope	Severe: slope
GcD2, GcD3, GgD2, GgD3	Severe: slope	Severe: slope
Glenville:		
GnA	Severe: high water table; moderately slow permeability.	Slight
GnB	Severe: high water table; moderately slow permeability.	Moderate: slope
Hatboro: Hb	Severe: high water table; flood hazard [1]	Severe: flood hazard [1]
Joppa:		
JpB	Slight [1]	Severe: moderately rapid to rapid permeability; slope. [1]
JpC	Slight [1]	Severe: moderately rapid to rapid permeability; slope. [1]
Kelly:		
KeB	Severe: high water table; somewhat poor natural drainage; slow permeability.	Moderate: slope
KeC2	Severe: high water table; somewhat poor natural drainage; slow permeability; slope.	Severe: slope
KfD	Severe: high water table; somewhat poor natural drainage; slow permeability; stoniness; slope.	Severe: slope
Keyport:		
KpA	Severe: high water table; slow permeability	Slight
KpB	Severe: high water table; slow permeability	Moderate: slope

See footnote at end of table.

considered in town and country planning—Continued

Homesites (three stories or less)		Streets and parking lots	Home gardens
With basements	Without basements		
Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.
Slight	Slight	Slight	Slight.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Moderate: slope.
Slight	Slight	Severe: slope	Severe: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: very low available water capacity and fertility; slope.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.
Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: high water table	Moderate: high water table	Severe: high water table	Moderate: high water table.
Severe: high water table	Moderate: high water table	Severe: high water table	Moderate: high water table; slope.
Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.	Severe: high water table; flood hazard.
Slight	Slight	Moderate: slope	Moderate: low available water capacity; gravel; slope.
Slight	Slight	Severe: slope	Severe: low available water capacity; gravel; slope.
Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability.	Severe: high water table; somewhat poor natural drainage.
Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope.	Severe: high water table; somewhat poor natural drainage; slope.
Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope; stoniness.	Severe: high water table; somewhat poor natural drainage; subsoil shrinkage and instability; slope; stoniness.
Moderate: high water table	Slight	Moderate: high water table	Moderate: high water table.
Moderate: high water table	Slight	Moderate: high water table; slope.	Moderate: high water table.

TABLE 9.—*Degree and kind of limitation to be*

Soil series and map symbols	Sewage disposal	
	Filter fields	Lagoons
Kinkora:		
KrA	Severe: high water table; poor natural drainage; slow permeability.	Slight
KrB	Severe: high water table; poor natural drainage; slow permeability.	Moderate: slope
Legore:		
LeB2	Slight	Moderate: moderate permeability; slope
LeC2, LgC3	Moderate: slope	Severe: slope; moderate permeability
LeD2, LeE, LfD, LfE, LgD3	Severe: slope	Severe: slope; moderate permeability
LfC	Moderate: slope	Severe: slope; moderate permeability
Leonardtown: Lr	Severe: poor natural drainage; high water table; slow permeability.	Slight
Loamy and clayey land:		
LyB	Severe: slow permeability	Slight to moderate: slope
LyD	Severe: slow permeability; slope	Severe: slope
LyE	Severe: slow permeability; slope	Severe: slope
*Manor:		
MbB2, McB2	Slight	Severe: moderate to moderately rapid permeability.
MbC2, MbC3, McC2, McC3	Moderate: slope	Severe: moderate to moderately rapid permeability; slope.
MbD2, MbD3, McD2, McD3, MdE, MfE.	Severe: slope	Severe: moderate to moderately rapid permeability; slope.
MgC	Slight to moderate: slope	Severe: moderate to moderately rapid permeability; slope.
MgD For Glenelg part of MgC and MgD, see Glenelg series.	Severe: slope	Severe: moderate to moderately rapid permeability; slope.
Matapeake:		
MkA	Slight to moderate: moderate permeability	Moderate: moderate permeability
MkB	Slight to moderate: moderate permeability	Moderate: moderate permeability; slope
Mattapex:		
MlA	Severe: moderately slow permeability	Slight
MlB	Severe: moderately slow permeability	Moderate: slope
Montalto:		
MsA	Severe: moderately slow permeability	Slight
MsB2	Severe: moderately slow permeability	Moderate: slope
MsC2	Severe: moderately slow permeability	Severe: slope
*Neshaminy:		
NeA	Moderate: moderate permeability	Moderate: moderate permeability
NeB2	Moderate: moderate permeability	Moderate: moderate permeability; slope
NeC2	Moderate: slope; moderate permeability	Severe: slope; moderate permeability

See footnote at end of table.

considered in town and country planning—Continued

Homesites (three stories or less)		Streets and parking lots	Home gardens
With basements	Without basements		
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope; erosion in LgC3.
Severe: slope	Severe: slope	Severe: slope	Severe: slope; stoniness in LfD, LfE; erosion in LgD3.
Moderate: stoniness; slope	Slight to moderate: slope	Slight to severe: slope; stoniness	Severe: slope; stoniness.
Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: low productivity.
Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability.	Severe: subsoil shrinkage and instability; slope.	Severe: low productivity; slope.
Severe: subsoil shrinkage and instability; slope.	Severe: subsoil shrinkage and instability; slope.	Severe: subsoil shrinkage and instability; slope.	Severe: low productivity; slope.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope; erosion in MbC3, McC3.
Severe: slope	Severe: slope	Severe: slope	Severe: slope; erosion in MbD3, McD3.
Moderate: stoniness; slope	Slight to moderate: slope	Severe: slope	Severe: slope; stoniness.
Severe: stoniness; slope	Severe: slope	Severe: slope	Severe: slope; stoniness.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: moderately high water table.	Slight	Moderate: moderately high water table.	Moderate: moderately high water table.
Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.
Slight	Slight	Slight	Slight.
Slight	Slight	Moderate: slope	Moderate: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope.

TABLE 9.—*Degree and kind of limitation to be*

Soil series and map symbols	Sewage disposal	
	Filter fields	Lagoons
*Neshaminy—Continued		
NsC	Moderate: moderate permeability	Severe: slope; moderate permeability
NsD, NsE For Montalto part of NsC, NsD, and NsE, see Montalto series.	Severe: slope; moderate permeability	Severe: slope; moderate permeability
Othello: Ot	Severe: high water table; poor natural drainage; moderately slow permeability.	Slight
Sand and gravel pits: Sa. Unsuited to these uses; material too variable.		
*Sassafras:		
ShB2, SlB2	Slight	Moderate: moderate permeability; slope
ShC2, SlC2	Slight	Severe: slope
SsD	Moderate: slope	Severe: slope
SsE For Joppa part of SsD and SsE, see Joppa series.	Severe: slope	Severe: slope
Stony land, steep: St	Severe: slope; excessive stoniness	Severe: slope; excessive stoniness
Swamp: Sw	Severe: ponded [1]	Severe: ponded [1]
Tidal marsh: Tm	Severe: tidal high water table; tidal flooding. [1]	Severe: tidal high water table; instability; tidal flooding.
Watchung:		
WaA	Severe: high water table; poor natural drainage; slow permeability.	Slight
WaB	Severe: high water table; poor natural drainage; slow permeability.	Moderate: slope
WcB	Severe: high water table; poor natural drainage; slow permeability.	Slight to moderate: slope
Whiteford:		
WhB	Moderate: 3 to 5 feet deep over bedrock	Moderate: 3 to 5 feet deep over bedrock; slope; moderate permeability.
WhC2	Moderate: 3 to 5 feet deep over bedrock	Moderate: 3 to 5 feet deep over bedrock; moderate permeability; slope.
Woodstown: WoB	Moderate: moderately high water table	Moderate: moderate permeability; slope

[1] Strong possibility of polluting nearby springs, wells, ponds, streams, or other surface or underground water resources.

soil. Landfill areas are subject to heavy vehicular traffic. Soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easily excavated. Unless otherwise stated, the ratings in table 10 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* might not be valid if trenches are much deeper. For some soils, reliable predictions can be made to a depth of 10 to 15 feet, but every site should be investigated before it is selected.

Soil surveys are particularly useful in preliminary determinations of those sites that are not suitable for sanitary landfill. They can save time and expense of more detailed investigation. They also can indicate those sites where favorable soils are located and where additional investigations appear warranted. The design engineer still needs to determine actual soil conditions to the depth necessary to obtain valid data for design purposes. Table 10 shows the degree of soil limitation and soil features causing moderate or severe limitations for trench-type and area-type landfills. It also indicates the suitability of the soils of the survey area as a source of cover material for area-type sanitary landfill.

Soil properties affecting trench-type sanitary landfill are

considered in town and country planning—Continued

Homesites (three stories or less)		Streets and parking lots	Home gardens
With basements	Without basements		
Moderate: slope; stoniness	Slight to moderate: slope	Slight to severe: stoniness; slope	Severe: stoniness; slope.
Severe: slope; stoniness	Severe: slope	Severe: stoniness; slope	Severe: stoniness; slope.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Slight	Slight	Moderate: slope	Moderate: slope.
Slight	Slight	Severe: slope	Severe: slope.
Moderate: slope	Moderate: slope	Severe: slope	Severe: slope; erosion.
Severe: slope	Severe: slope	Severe: slope	Severe: slope; erosion.
Severe: slope; excessive stoniness.	Severe: slope; excessive stoniness.	Severe: slope; excessive stoniness.	Severe: slope; excessive stoniness.
Severe: ponded	Severe: ponded	Severe: ponded	Severe: ponded.
Severe: tidal high water table; instability; tidal flooding.	Severe: tidal high water table; instability; tidal flooding.	Severe: tidal high water table; instability; tidal flooding.	Severe: tidal high water table; salinity; tidal flooding.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.
Severe: high water table; poor natural drainage; stoniness.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage; stoniness.
Moderate: 3 to 5 feet deep over bedrock.	Slight	Moderate: slope	Moderate: slope.
Moderate: 3 to 5 feet deep over bedrock; slope.	Moderate: slope	Severe: slope	Severe: slope.
Moderate: moderately high water table.	Slight	Moderate: moderately high water table; slope.	Moderate: slope; moderately high water table.

depth to seasonal high water table, soil drainage class, flooding, permeability, slope, soil texture, stoniness, rockiness, and depth over and kind of underlying bedrock. Because trenches in many landfills are as much as 15 feet deep or more, a geological investigation of the area is needed to determine the potential for pollution of ground water, as well as to obtain the design of the sanitary landfill.

In the area landfill, refuse is placed in successive layers on the surface of the soil. Daily cover material and final cover material must be imported because trenches are dug only for the purposes of obtaining cover material. A final cover of soil at least 2 feet thick is placed over the fill when it is completed. The soil under the proposed site for an area landfill should be investigated to determine the potential penetration and pollution of ground water supplies by leachates produced by water percolating through the landfill. Even though a soil survey is available, detailed onsite investigation should be made before a final decision is made to use a proposed site. The soil properties affecting area-type landfills are depth to a seasonal high water table, soil drainage class, flooding, permeability, and slope.

Cover material for area-type landfill is obtained from some other area, not from the site under construction. Table 10 rates all the soils of the survey area for suitability as cover mater-

TABLE 10.—*Guide to use of the soil for sanitary landfill*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that appear in the first column of this table]

Soil series and map symbols	Degree and kind of limitation for—		Suitability as a source of cover material for area type
	Trench type	Area type	
Aldino:			
AdA, AdB	Moderate: seasonally perched water table.	Slight	Fair: seasonally perched water table; firm and brittle.
AdC	Moderate: seasonally perched water table.	Moderate: slope	Fair: seasonally perched water table; firm and brittle; slope.
AsB	Severe: seasonally perched water table; stoniness.	Slight	Fair: seasonally perched water table; firm and brittle; stoniness.
Alluvial land: Av	Severe: high water table; flood hazard.[1]	Severe: high water table; flood hazard.[1]	Poor: high water table; flood hazard.
Baile: BaA, BaB	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Poor: High water table; poor natural drainage; sticky and plastic.
Beltsville: BeA, BeB, BeC	Moderate: seasonally perched water table.	Slight	Fair: seasonally perched water table; firm and brittle.
Brandywine:			
BrC2	Severe: moderately rapid permeability.	Severe: moderately rapid permeability.	Fair: slope.
BrD3, BrE3	Severe: moderately rapid permeability; slope.	Severe: moderately rapid permeability; slope.	Poor: Slope.
Chester:			
CcA, CcB2, CgB2	Slight	Slight	Good.
CcC2, CgC2	Slight	Moderate: slope	Fair: slope.
CgD2	Moderate: slope	Severe: slope	Poor: slope.
*Chillum: ChB2, CkC2 For Neshaminy part of CkC2, see Neshaminy series.	Slight	Slight	Good.
Chrome: CrE	Severe: 1½ to 3½ feet deep over bedrock; slope.	Severe: slope	Severe: slope; sticky and plastic; 1½ to 3½ feet deep over bedrock.
Codorus: Cu	Severe: high water table, flood hazard.[1]	Severe: high water table; flood hazard.[1]	Poor: high water table; flood hazard.
Comus: Cv	Severe: flood hazard [1]	Severe: flood hazard [1]	Good: poor if flooded.
Cut and fill land: Cx. Material too variable.			
Delanco: DcA, DcB	Moderate: high water table.	Slight	Good.
Elioak:			
EhB2	Moderate: clayey material; sticky.	Slight	Fair: clayey material; sticky.
EhC2	Moderate: clayey material; sticky.	Moderate: slope	Fair: clayey material; sticky; slope.
Elkton: En	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Poor: high water table; poor natural drainage; clayey material.
Elsinboro: EsA, EsB2, EsC2	Slight	Slight	Good.
Evesboro: EvC	Severe: rapid permeability [1]	Severe: rapid permeability; slope.[1]	Fair: sandy material; slope.

See footnote at end of table.

TABLE 10.—*Guide to use of the soil for sanitary landfill*—Continued

Soil series and map symbols	Degree and kind of limitation for—		Suitability as a source of cover material for area type
	Trench type	Area type	
Fallsington: Fs	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Poor: high water table; poor natural drainage.
Glenelg:			
GcB2, GgB2	Slight	Slight	Good.
GcC2, GcC3, GgC2, GgC3	Slight	Moderate: slope	Fair: slope.
GcD2, GcD3, GgD2, GgD3	Moderate: slope	Severe: slope	Poor: slope.
Glenville: GnA, GnB	Moderate: seasonally perched water table.	Slight to moderate: seasonally perched water table.	Fair: seasonally perched water table; firm and brittle material.
Hatboro: Hb	Severe: high water table; poor natural drainage; flood hazard.[1]	Severe: high water table; poor natural drainage; flood hazard.[1]	Poor: high water table; poor natural drainage; clayey material; flood hazard.
Joppa: JpB, JpC	Severe: moderately rapid to rapid permeability.[1]	Severe: moderately rapid to rapid permeability.[1]	Poor: more than 35 percent coarse fragments.
Kelly:			
KeB	Severe: clayey material; very sticky and plastic; high water table.	Moderate: somewhat poor natural drainage.	Poor: clayey material; very sticky and plastic; high water table; firm.
KeC2	Severe: clayey material; very sticky and plastic; high water table; slope.	Moderate: somewhat poor natural drainage; slope.	Poor: clayey material; very sticky and plastic; high water table; slope; firm.
KfD	Severe: clayey material; very sticky and plastic; slope; stoniness.	Moderate to severe: somewhat poor natural drainage; slope.	Poor: clayey material; very sticky and plastic; slope; stoniness; firm.
Keyport: KpA, KpB	Moderate: clayey material; sticky and plastic; high water table.	Slight	Fair: clayey material; slightly sticky and plastic; high water table.
Kinkora: KrA, KrB	Severe: high water table; poor natural drainage; sticky and plastic.	Severe: high water table; poor natural drainage.	Poor: high water table; poor natural drainage; sticky and plastic.
Legore:			
LeB2	Moderate: clayey material; sticky and plastic.	Slight	Fair: clayey material; sticky and plastic.
LeC2, LfC, LgC3	Moderate: clayey material; sticky and plastic; stoniness in LfC.	Moderate: slope	Fair: clayey material; sticky and plastic; slope; stoniness in LfC.
LeD2, LfD, LfE, LgD3	Moderate: clayey material; sticky and plastic; stoniness in LfD and LfE.	Severe: slope	Poor: clayey material; sticky and plastic; slope; stoniness in LfD and LfE.
LeE	Severe: clayey material; sticky and plastic; slope.	Severe: slope	Poor: clayey material; sticky and plastic; slope.
Leonardtown: Lr	Severe: high water table; poor natural drainage.	Severe: high water table; poor natural drainage.	Poor: high water table; poor natural drainage; firm and brittle.
Loamy and clayey land:			
LyB, LyD	Severe: clayey material; very sticky and plastic; poor stability.	Slight	Poor: clayey material; very sticky and plastic.
LyE	Severe: clayey material; very sticky and plastic; poor stability; slope.	Moderate: slope	Poor: clayey material; very sticky and plastic; slope.

See footnote at end of table.

TABLE 10.—*Guide to use of the soil for sanitary landfill*—Continued

Soil series and map symbols	Degree and kind of limitation for—		Suitability as a source of cover material for area type
	Trench type	Area type	
*Manor:			
MbB2, McB2	Slight to severe: moderate to moderately rapid permeability.	Slight to severe: moderate to moderately rapid permeability.	Good in MbB2; fair in McB2; coarse fragments.
MbC2, MbC3, McC2, McC3	Slight to severe: moderate to moderately rapid permeability.	Moderate to severe: moderate to moderately rapid permeability; slope.	Fair: slope; coarse fragments in McC2 and McC3.
MbD2, MbD3, McD2, McD3	Moderate to severe: moderate to moderately rapid permeability; slope.	Severe: moderate to moderately rapid permeability; slope.	Poor: slope; coarse fragments in McD2 and McD3.
MdE, MfE	Severe: moderate to moderately rapid permeability; slope.	Severe: moderate to moderately rapid permeability; slope.	Poor: slope; stoniness in MdE.
MgC	Severe: moderate to moderately rapid permeability; stoniness.	Moderate to severe: moderate to moderately rapid permeability; slope.	Poor: stoniness; slope.
MgD For Glenelg part of MgC and MgD, see Glenelg series.	Severe: moderate to moderately rapid permeability; stoniness; slope.	Severe: moderate to moderately rapid permeability; slope.	Poor: stoniness; slope.
Matapeake: MkA, MkB	Slight	Slight	Good.
Mattapex: MlA, MlB	Moderate: clayey material; seasonally high water table.	Slight	Fair: clayey material; seasonally high water table; firm.
Montalto:			
MsA, MsB2	Moderate: clayey material; sticky and plastic.	Slight	Fair: clayey material; sticky and plastic.
MsC2	Moderate: clayey material; sticky and plastic.	Moderate: slope	Fair: clayey material; sticky and plastic; slope.
*Neshaminy:			
NeA, NeB2	Moderate: clayey material; sticky and plastic.	Slight	Fair: clayey material; sticky and plastic.
NeC2	Moderate: clayey material; sticky and plastic.	Moderate: slope	Fair: clayey material; sticky and plastic; slope.
NsC	Severe: clayey material; sticky and plastic; stoniness; slope.	Slight to moderate: slope	Poor: clayey material; sticky and plastic; stoniness; slope.
NsD, NsE For Montalto part of NsC, NsD, and NsE, see Montalto series.	Severe: clayey material; sticky and plastic; stoniness; slope.	Severe: slope	Poor: clayey material; sticky and plastic; stoniness; slope.
Othello: Ot	Severe: high water table; poorly drained.	Severe: high water table; poor natural drainage.	Poor: high water table; poorly drained.
Sand and gravel pits: Sa. Material too variable to be rated.			
*Sassafras:			
ShB2, ShC2, SlB2, SlC2	Slight	Slight	Good.
SsD	Slight	Moderate: slope	Fair: slope.
SsE For Joppa part of SsD and SsE, see Joppa series.	Moderate to severe: slope	Severe: slope	Poor: slope.
Stony land, steep: St	Severe: stoniness; slope	Severe: stoniness; slope	Poor: stoniness; slope.
Swamp: Sw	Severe: high water table; poor natural drainage; ponding.[1]	Severe: high water table; poorly drained; ponding.[1]	Severe: high water table; poorly drained; ponding.

See footnote at end of table.

TABLE 10.—*Guide to use of the soil for sanitary landfill*—Continued

Soil series and map symbols	Degree and kind of limitation for—		Suitability as a source of cover material for area type
	Trench type	Area type	
Tidal marsh: Tm	Severe: tidal high water table; tidal flooding.[1]	Severe: tidal high water table; tidal flooding.[1]	Poor: tidal high water table; tidal flooding.
Watchung: WaA, WaB, WcB	Severe: high water table; poor natural drainage; stoniness in WcB.	Severe: high water table; poorly drained.	Poor: high water table; poorly drained; stoniness in WcB.
Whiteford:			
WhB	Moderate: 3 to 5 feet deep over bedrock.	Slight	Good.
WhC2	Moderate: 3 to 5 feet deep over bedrock.	Moderate: slope	Fair: slope.
Woodstown: WoB	Moderate: seasonally high water table.	Slight	Good.

[1] Possible pollution hazard to nearby wells, springs, streams, ponds, or other bodies of water.

ial. Suitability for cover is based on soil properties which reflect workability; ease of digging, moving, and spreading the soil material over the refuse daily, during both wet and dry periods; and slope, wetness, and thickness of material.

Recreational development

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 11, the soils of the Harford County Area are rated slight, moderate, or severe, according to limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails. These ratings are based on the assumption that a good plant cover can be established and maintained.

A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these, is required.

Playgrounds are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use should withstand intensive foot traffic. The best soils have good drainage, no flooding during periods of heavy use, and a surface that is free of coarse fragments and rock outcrops and is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Camp areas are used intensively as sites for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, no flooding during periods of heavy use, and a surface that is free of rocks and coarse fragments and is firm after rains but not dusty when dry.

Picnic areas are attractive natural or landscaped tracts used chiefly for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry, are free from flooding during the season of use, and do not have slopes or stoniness that greatly increases the cost of leveling sites or of building access roads.

Paths and trails are used for local and cross country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Formation, Morphology, and Classification of the Soils

This section describes the major factors that have affected the formation and morphology of the soils of the Harford County Area. It also explains the current system of soil classification and classifies the soils in the survey area according to that system.

Factors of Soil Formation

Soils form through the interaction of climate, plant and animal life, parent material, relief, and time. The relative influence of each of these factors generally varies from place to place. Local variations in soils are caused by differences in the kind of parent material and in topography and drainage. In places one factor dominates in the formation of a soil and determines most of its properties.

Climate

The climate of the Harford County Area is characteristic of a humid continental type marked by extreme seasonal temperature changes. Annual precipitation is about 46 inches, and mean annual air temperature is about 53° F. The distribution of rainfall, which is nearly uniform throughout

TABLE 11.—*Estimated degree and kind of limitations for specified recreational uses*

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Aldino:				
AdA	Moderate: moderately high perched water table; slow permeability.	Moderate: moderately high perched water table; slow permeability.	Moderate: moderately high perched water table.	Slight.
AdB	Moderate: moderately high perched water table; slow permeability; slope.	Moderate: moderately high perched water table; slow permeability.	Moderate: moderately high perched water table.	Slight.
AdC	Severe: slope; moderately high perched water table; slow permeability.	Moderate: moderately high perched water table; slow permeability; slope.	Moderate: moderately high perched water table; slope.	Slight.
AsB	Moderate to severe: moderately high perched water table; slow permeability; stoniness; slope.	Moderate: moderately high perched water table; slow permeability; stoniness; slope.	Moderate: moderately high perched water table; slope.	Moderate: stoniness.
Alluvial land: Av	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.	Severe: mostly poor natural drainage; flood hazard.
Baile: BaA, BaB	Severe: poor natural drainage; high water table; moderately slow to slow permeability.	Severe: poor natural drainage; high water table; moderately slow to slow permeability.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Beltsville:				
BeA	Moderate: seasonally perched water table; slow permeability. [1]	Moderate: seasonally perched water table; slow permeability. [1]	Moderate: seasonally perched water table.	Slight.
BeB	Moderate: seasonally perched water table; slow permeability; [1] slope.	Moderate: seasonally perched water table; slow permeability.[1]	Moderate: seasonally perched water table.	Slight.
BeC	Severe: slope; seasonally perched water table; slow permeability.	Moderate: seasonally perched water table; slow permeability.[1]	Moderate: seasonally perched water table.	Slight.
Brandywine:				
BrC2	Severe: coarse fragments on surface; slope.	Moderate: slope	Moderate: slope	Slight.
BrD3	Severe: coarse fragments on surface; slope.	Severe: slope	Severe: slope	Moderate: coarse fragments on surface; slope.
BrE3	Severe: coarse fragments on surface; slope.	Severe: slope	Severe: slope	Severe: slope.
Chester:				
CcA	Slight	Slight	Slight	Slight.
CcB2	Moderate: slope	Slight	Slight	Slight.
CgB2	Moderate: coarse fragments on surface; slope.	Slight	Slight	Slight.
CcC2, CgC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
CgD2	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.

See footnote at end of table.

TABLE 11.—*Estimated degree and kind of limitations for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Chillum:				
ChB2	Moderate: slope	Slight	Slight	Slight.
CkC2	Severe: slope	Slight	Slight	Slight.
For Neshaminy part of CkC2, see Neshaminy series.				
Chrome: CrE	Severe: sticky surface; coarse fragments on surface.	Severe: slope; sticky surface.	Severe: slope; sticky surface.	Moderate to severe: sticky surface; slope.
Codorus: Cu	Moderate: moderately high water table; flood hazard.	Severe: flood hazard	Moderate: moderately high water table; flood hazard.	Moderate: flood hazard.
Comus: Cv	Moderate: flood hazard	Severe: flood hazard	Moderate: flood hazard	Moderate: flood hazard.
Cut and fill material: Cx. Material too variable to be rated.				
Delanco:				
DcA	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
DcB	Moderate: moderately high water table; moderately slow permeability; slope.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
Elioak:				
EhB2	Moderate: slope	Slight	Slight	Slight.
EhC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Elkton: En	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table; slow permeability.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Elsinboro:				
EsA	Slight	Slight	Slight	Slight.
EsB2	Moderate: slope	Slight	Slight	Slight.
EsC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Evesboro: EvC	Severe: loamy sand, subject to soil blowing; slope.	Moderate: loamy sand surface layer; slope.	Moderate: loamy sand surface layer; slope.	Moderate: loamy sand surface layer.
Fallsington: Fs	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.	Severe: poor natural drainage; high water table.
Glenelg:				
GcB2	Moderate: slope	Slight	Slight	Slight.
GgB2	Moderate: coarse fragments on surface; slope.	Slight	Slight	Slight.
GcC2, GcC3, GgC2, GgC3	Severe: slope	Moderate: slope	Moderate: slope	Slight.
GcD2, GcD3, GgD2, GgD3.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.

See footnote at end of table.

TABLE 11.—*Estimated degree and kind of limitations for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Glenville:				
GnA	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight to moderate: moderately well drained to somewhat poorly drained.
GnB	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight to moderate: moderately well drained to somewhat poorly drained.
Hatboro: Hb	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.	Severe: poor natural drainage; high water table; flood hazard.
Joppa:				
JpB	Severe: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
JpC	Severe: coarse fragments on surface; slope.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.	Moderate: coarse fragments on surface.
Kelly:				
KeB	Severe: somewhat poor natural drainage; slow permeability.	Severe: somewhat poor natural drainage; slow permeability.	Moderate: somewhat poor natural drainage; moderately high water table.	Moderate: somewhat poorly drained; moderately high water table.
KeC2	Severe: somewhat poor natural drainage; slow permeability; slope.	Severe: somewhat poor natural drainage; slow permeability.	Moderate: somewhat poor natural drainage; moderately high water table; slope.	Moderate: somewhat poorly drained; moderately high water table.
KfD	Severe: somewhat poor natural drainage; slow permeability; slope; stony surface.	Severe: somewhat poor natural drainage; slow permeability.	Moderate to severe: somewhat poor natural drainage; moderately high water table; slope.	Moderate: somewhat poorly drained; moderately high water table; stony surface.
Keyport:				
KpA	Moderate: moderately high water table; slow permeability.	Moderate: moderately high water table; slow permeability.	Moderate: moderately high water table.	Slight.
KpB	Moderate: moderately high water table; slow permeability; slope.	Moderate: moderately high water table; slow permeability.	Moderate: moderately high water table.	Slight.
Kinkora: KrA, KrB	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table.	Severe: poorly drained; high water table.
Legore:				
LeB2	Moderate: slope	Slight	Slight	Slight.
LeC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
LeD2	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
LeE, LfE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
LfC	Severe: slope	Moderate: stoniness; slope.	Moderate: slope	Moderate: stoniness; slope.
LfD	Severe: slope	Severe: slope; stoniness.	Severe: slope	Moderate: stoniness; slope.
LgC3	Severe: slope	Moderate: sticky surface; slope.	Moderate: sticky surface; slope.	Moderate: sticky surface.
LgD3	Severe: slope	Severe: slope	Severe: slope	Moderate: sticky surface; slope.

See footnote at end of table.

TABLE 11.—*Estimated degree and kind of limitations for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Leonardtown: Lr	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table.	Severe: poorly drained; high water table.
Loamy and clayey land:				
LyB	Moderate: slow permeability;[1] slope.	Moderate: slow permeability.[1]	Slight	Slight.
LyD	Severe: slope	Moderate: slow permeability;[1] slope.	Slight to moderate: slope.	Slight.
LyE	Severe: slope	Severe: slope	Severe: slope	Moderate to severe: slope.
Manor:				
MbB2	Moderate: slope	Slight	Slight	Slight.
McB2	Moderate: coarse fragments on surface; slope.	Slight	Slight	Slight.
MbC2, MbC3, McC2, McC3.	Severe: slope	Moderate: slope	Moderate: slope	Slight.
MbD2, MbD3, McD2, McD3.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
MdE, MfE	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
MgC	Moderate to severe: stoniness; slope.	Moderate: stoniness; slope.	Slight to moderate: slope.	Moderate: stoniness.
MgD For Glenelg part of MgC and MgD, see Glenelg series.	Severe: slope	Severe: slope	Severe: slope	Moderate: stoniness; slope.
Matapeake:				
MkA	Slight	Slight	Slight	Slight.
MkB	Moderate: slope	Slight	Slight	Slight.
Mattapex:				
MlA	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
MlB	Moderate: moderately high water table; moderately slow permeability; slope.	Moderate: moderately high water table; moderately slow permeability.	Moderate: moderately high water table.	Slight.
Montalto:				
MsA	Moderate: moderately slow permeability.	Moderate: moderately slow permeability.	Slight	Slight.
MsB2	Moderate: moderately slow permeability; slope.	Moderate: moderately slow permeability.	Slight	Slight.
MsC2	Severe: slope	Moderate: moderately slow permeability; slope.	Moderate: slope	Slight.
Neshaminy:				
NeA	Slight	Slight	Slight	Slight.
NeB2	Moderate: slope	Slight	Slight	Slight.
NeC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.

See footnote at end of table.

TABLE 11.—*Estimated degree and kind of limitations for specified recreational uses*—Continued

Soil series and map symbols	Playgrounds	Camp areas	Picnic areas	Paths and trails
Neshaminy—Continued				
NsC	Moderate to severe: slope; stoniness.	Moderate: slope; stoniness.	Slight to moderate: slope.	Moderate: stoniness.
NsD	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Moderate: stoniness; slope.
NsE For Montalto part of NsC, NsD, and NsE, see Montalto series.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: stoniness; slope.
Othello: Ot	Severe: poorly drained; high water table.	Severe: poorly drained; high water table.	Severe: poor natural drainage; high water table.	Severe: poorly drained; high water table.
Sand and gravel pits: Sa. Material too variable to be rated.				
Sassafras:				
ShB2, SlB2	Moderate: slope	Slight	Slight	Slight.
ShC2, SlC2	Severe: slope	Slight	Slight	Slight.
SsD	Severe: slope; coarse fragments on surface of Joppa soil.	Moderate: slope; coarse fragments on surface of Joppa soil.	Moderate: slope; coarse fragments on surface of Joppa soil.	Slight and moderate: coarse fragments on surface of Joppa soil.
SsE For Joppa part of SsD and SsE, see Joppa series.	Severe: slope; coarse fragments on surface of Joppa soil.	Severe: slope	Severe: slope	Moderate to severe: coarse fragments on surface of Joppa soil; slope.
Stony land, steep: St	Severe: extreme stoniness; slope.	Severe: extreme stoniness; slope.	Severe: extreme stoniness; slope.	Severe: extreme stoniness; slope.
Swamp: Sw	Severe: ponded for long periods.	Severe: ponded for long periods.	Severe: ponded for long periods.	Severe: ponded for long periods.
Tidal marsh: Tm	Severe: tidal high water table; no trafficability; tidal flooding.	Severe: tidal high water table; no trafficability; tidal flooding.	Severe: tidal high water table; no trafficability; tidal flooding.	Severe: tidal high water table; no trafficability; tidal flooding.
Watchung: WaA, WaB, WcB	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table; slow permeability.	Severe: poorly drained; high water table.	Severe: poorly drained; high water table.
Whiteford:				
WhB	Moderate to severe: slope.	Slight	Slight	Slight.
WhC2	Severe: slope	Moderate: slope	Moderate: slope	Slight.
Woodstown: WoB	Moderate: moderately high water table.	Moderate: moderately high water table.	Moderate: moderately high water table.	Slight.

[1] Slow permeability is no more than a moderate limitation because the soil is generally dry for long periods during seasons of use.

the year, reaches a maximum in August. During the growing season April through September, rainfall averages about 25 inches.

The humid, continental climate has caused strong weathering and leaching of the soils. In most places the soil material has weathered to a comparatively great depth because it has been exposed to climatic forces for a fairly long period of geologic time. The only material that is not deeply and strongly weathered is material that is either highly resistant to weathering or that has been in its present position for only a short time.

Most of the bases have been leached, and the soils contain no free carbonates. All of the soils are acid, and most of them are strongly acid to extremely acid. Weathering and leaching have left the natural supply of plant nutrients low, though some of the soils contain a moderate residual supply. The effects of leaching and translocation of clay have been fairly uniform throughout the county, except for some flood plain

deposits that are too recent to have been affected. Alternate wetting and drying and freezing and thawing are responsible for the blocky structure in a strongly expressed clay-enriched subsoil.

For more detailed information on climate, see the section "General Nature of the Area."

Plant and animal life

All living organisms, including vegetation, animals, bacteria, and fungi, are important to soil formation. Vegetation is generally responsible for the amount of organic matter, color of the surface layer, and amount of nutrients in the soil. Such animals as earthworms, cicada, and burrowing animals keep the soil open and porous. Bacteria and fungi decompose vegetation and thus release nutrients for plants.

In the Harford County Area, the native forests have had more influence on soil formation than have any other living organisms. The native vegetation of the county was dominantly a forest of mixed hardwoods and a few conifers. Oak was the dominant species. Other deciduous hardwoods were hickory, beech, poplar, maple, elm, dogwood, and birch. The evergreens were mainly Virginia pine, shortleaf pine, and holly.

Most hardwoods use a large amount of calcium and other bases if those elements are available. They take up such plant nutrients from the soil and store them in their roots, stems, and leaves. When deciduous trees shed their leaves or when the plants die and decay, the plant nutrients are returned to the soil and are used by other plants. Thus, in areas where the soils are naturally well supplied with bases, a never-ending cycle takes place. Most soils of the Harford County Area, however, have never been high in calcium. Furthermore, only those soils that formed in material weathered from igneous rocks contain appreciable amounts of other bases. Consequently, the soils are acid, even under a cover of hardwoods.

Soils that are strongly acid and low in fertility are better suited to pines than to most hardwoods. Such trees as Virginia pine, which require only a minimum amount of calcium and other bases, have invaded some areas that were formerly in hardwoods. Their needles return only a small amount of organic matter and plant nutrients to the soil.

Man has greatly changed the surface layer where he has cleared the forests and plowed the land. He has added fertilizers, mixed some of the soil horizons, and has even moved soil materials from place to place.

Parent material

Parent material is the unconsolidated rock material from which soils form. It determines the mineral and chemical composition of the soil and to a large extent the rate at which soil formation takes place.

The soils of the Harford County Area formed in two general kinds of parent material. These are residuum, or material that was derived from the weathering of rocks in place, and material consisting of sand, silt, clay, and fragments of rocks that have been transported by water, wind, gravity, or a combination of these forces. Residuum, the more extensive, covers roughly the northern three-fourths of the county. It was derived from several kinds of Precambrian and lower Paleozoic igneous and metamorphic rocks in the Piedmont physiographic province.

Some of the unaltered igneous rocks in this county are diabase, diorite, granodiorite, serpentine, and gabbro. Montalto, Legore, Neshaminy, Aldino, Kelly, Chrome, and Watchung soils formed in material weathered from these rocks.

The metamorphic rocks include schist, gneiss, and slate. Some of the soils in the Harford County Area that formed in material weathered in place from these metamorphic rocks are Chester, Glenelg, Glenville, Manor, Elioak, Brandywine, and Whiteford soils (fig. 14, top). Loess might have influenced soil formation in the upper part of the solum of many of these Piedmont soils, though evidence to that effect is not positive.

The Coastal Plain, which covers roughly the southern fourth of the Harford County Area, forms part of the northern edge of the Atlantic Coastal Plain physiographic province (*5*). Unconsolidated Coastal Plain sediments range in geologic age from Cretaceous to Quaternary (*5*). The four formations of the unconsolidated Potomac Group of Early Cretaceous age and the Talbot Formation of Pleistocene age are present in the Coastal Plain (fig. 14, bottom).

Sediments in the upper or northern part of the Coastal Plain are of the Potomac Group. These sediments provide the parent material for the soils in this region. Loamy and clayey land formed in areas where the texture of these sediments ranged from loamy to clayey. In the thin layer of loesslike material that commonly covers these deposits, Chillum, Beltsville, and Leonardtown soils formed. In the very gravelly areas the Joppa soils formed.

At lower elevations in the lower part or southern part of the Coastal Plain are the younger Quaternary deposits of the Talbot Formation, much of which are also covered by a mantle of silt, possibly loess of Pleistocene age. Matapeake, Mattapex, and Othello soils are examples of soils that formed in this material. Sassafras, Woodstown, and Fallsington soils formed where this sediment is sandy, and Evesboro soils formed where this sediment is very sandy.

Elsinboro, Delanco, and Kinkora soils formed in old micaceous alluvial deposits on low terraces along some of the major streams. The materials most recently deposited are alluvial sediments on flood plains, in depressions, and on low stream terraces. These sediments are the parent material of the Codorus, Comus, and Hatboro soils.

Relief

The Harford County Area straddles the boundary between the unconsolidated sediments of the Atlantic Coastal Plain on the southeast and the metamorphic and igneous rocks of the Appalachian Piedmont on the northwest. The Piedmont Plateau generally is rolling to steep and strongly dissected. The highest elevation is more than 800 feet above mean sea level. The Coastal Plain is mostly rolling and highly dissected in the upper northern part and nearly level to gently sloping in the lower southern part. The Coastal Plain ranges in elevation from more than 400 feet above mean sea level in the northern part, to sea level along the southern boundary of the survey area. The southern part is a broad lowland that rises gradually from sea level along Chesapeake Bay to an elevation of about 90 feet near Aberdeen. Although this part of the Coastal Plain is less dissected than in the north, such large estuaries as Bush River and Bird River form broad reentrants into this lowland.

Differences in elevation and shape of the land surface account for some of the differences among soils formed in the

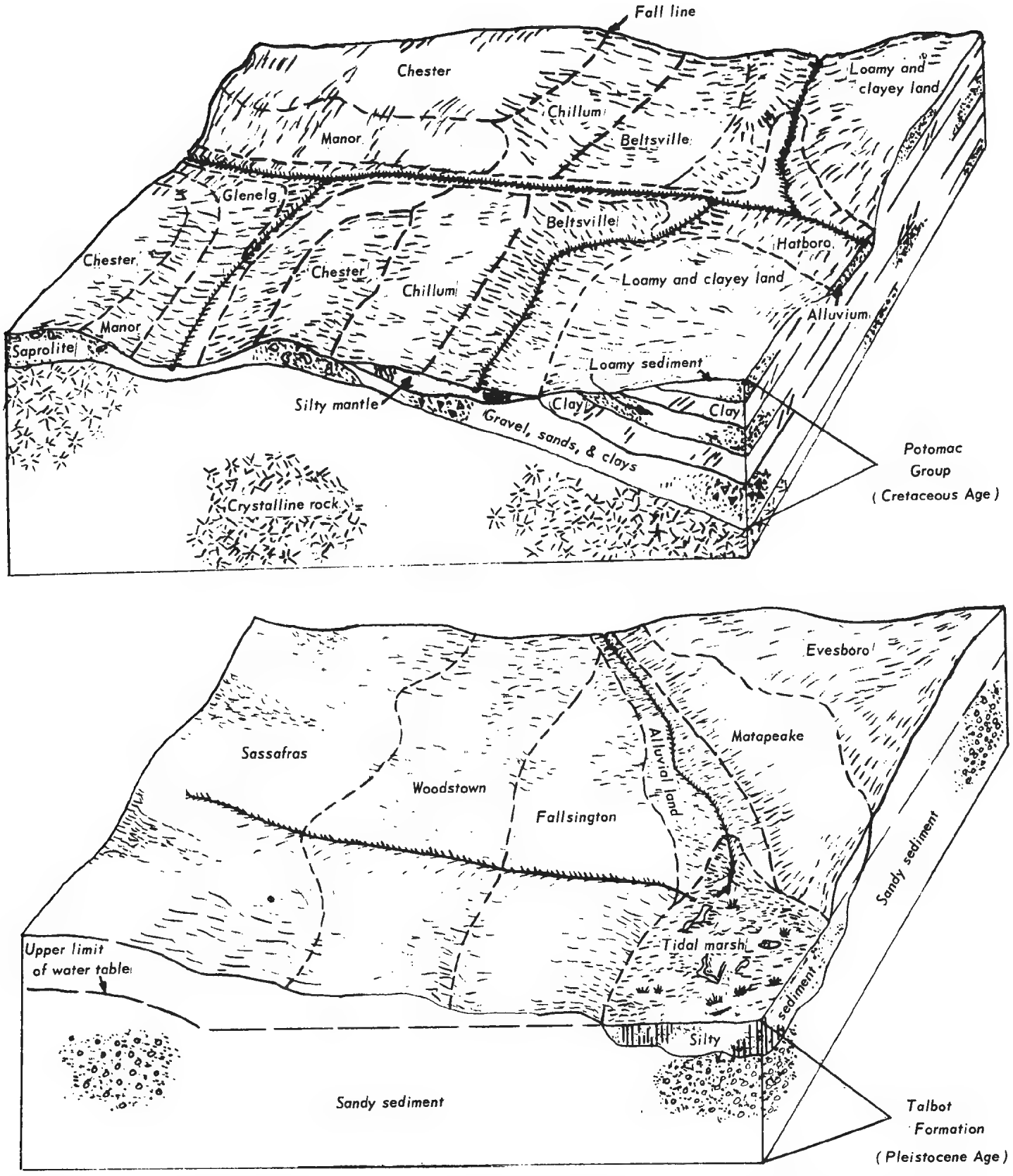

Figure 14.—Top: To the left of the Fall Line are soils and parent materials of the Piedmont. To the right are soils and parent materials of the Coastal Plain. *Bottom:* Soils and parent materials of the Coastal Plain.

same kind of parent material. The Manor and Brandywine soils of the Piedmont are well drained to excessively drained and generally are on the steeper parts of the landscape. As the relief becomes more gently rolling and the landscape more stable, the well-drained Chester, Elioak, and Glenelg soils are dominant. Where the Piedmont landscape is nearly level, the moderately well drained and somewhat poorly drained Glenville soils are common. The poorly drained Baile and Watchung soils are on flats and in depressions, particularly around the heads of drainageways and on foot slopes. Relief affects microclimate, and thus, greatly influences the plant and animal life on and in the soil.

Time

The parent material of the soils in the Harford County Area ranges from very young to very old. The youngest is the alluvium deposited on flood plains during our present, or Holocene, geologic epoch. The oldest is that parent material which weathered from the Precambrian Baltimore Gneiss, the oldest rock in the Maryland Piedmont.

The length of time the parent material has been in place and exposed to the active forces of climate and vegetation is an important factor in the formation of soils. In the Comus, Codorus, and Hatboro, and other soils that formed in alluvium, no strongly differentiated profile has formed because the soil material has not been in place long enough.

The age of a soil, however, is influenced by other factors as well as by time. The Brandywine soil formed in residuum weathered from Baltimore Gneiss, the oldest rock in the county, and yet it has much more weakly expressed horizonation than the Neshaminy or Sassafras soils, which formed in much younger parent materials. Two soils that have been forming for about the same length of time have not necessarily reached the same stage of profile formation because relief and parent material differ. If the parent material weathered from rocks that resist weathering, the formation of a soil profile is slow. Also, profile formation is slow in steep areas because soil material is removed almost as soon as it forms or is deposited.

The combination that ultimately controls the character of the soil profile is duration and intensity of weathering and the weatherability of the material.

Morphology of Soils

The results of the soil-forming factors are evidenced by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface down to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, the A, B, and C horizons (*12*). These major horizons can be further subdivided by the use of numbers and letters to indicate differences within one horizon. The B2t horizon, for example, represents a B horizon that contains an accumulation of clay. The Elioak soil is an example of a soil that contains a well-expressed B2t horizon.

The A horizon is the surface layer. An A1 horizon is that part of the surface layer that contains the largest accumulation of organic matter. The A horizon is also the layer of maximum leaching or eluviation of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, the horizon is called an A2. In some soils in the Harford County Area, the A2 horizon is a brownish color, as a result of the oxidation of iron.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer.

In some soils, the B horizon is formed by alteration of the original material rather than by illuviation. The alteration can be caused by oxidation and reduction of iron or by the weathering of clay minerals. The B horizon commonly has blocky or prismatic structure; it generally is firmer and lighter colored than the A1 horizon, but it is darker colored than the C horizon.

The C horizon is below the A or B horizon. It consists of materials that are little altered by the soil-forming processes, but can be modified by weathering.

Processes of Soil Formation

In the Harford County Area, several processes are involved in the formation of soil horizons. Among these are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes are continually taking place and generally at the same time throughout the profile. Such processes have been going on for thousands of years.

The accumulation and incorporation of organic matter take place as plant residue decomposes. These additions darken the surface layer and help to form the A1 horizon. If organic matter is lost, it generally is replaced slowly.

In order for soils to have distinct subsoil horizons, some of the lime and other soluble salts are leached before the translocation of clay minerals. Among the factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

Well drained and moderately well drained soils in the Harford County Area generally have a yellowish-brown or reddish-brown subsoil. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains. The Brandywine, Delanco, Keyport, and Montalto soils are examples of soils in the county that have a mostly yellowish-brown or reddish-brown subsoil.

A fragipan has formed in the subsoil of some of the moderately well drained, somewhat poorly drained, and poorly drained soils in the county. It is very firm and brittle if moist, and very hard if dry. Soil particles are tightly packed so that bulk density is high and pore space is low. Genesis of these horizons is not fully understood, but studies show that swelling and shrinking takes place in alternate wet and dry periods. This shrink-swell process accounts for the packing of soil particles and also for a gross polygonal pattern of cracks in the fragipan. Clay, silica, and oxides of aluminum are the most likely cementing agents that might cause brittleness and hardness. Aldino, Beltsville, Glenville, and Leonardtown soils are examples of soils in the county that have a fragipan.

The reduction and transfer of iron is associated mainly with the wetter, more poorly drained soils. This process is called gleying. Moderately well drained to somewhat poorly drained soils have mottles of yellowish brown and reddish brown, which indicate the segregation of iron. In poorly drained soils, such as the Baile, Elkton, and Watchung soils, the grayish colored subsoil and underlying material indicate reduction and transfer of iron by removal of solution.

TABLE 12.—*Soil series arranged to show relationships in position, parent material, and drainage*

Parent material	Excessively drained	Somewhat excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly
Residual Soils on Uplands						
Mica-schist and granitized schist		Manor	Chester, Elioak, Glenelg, Manor.	Glenville	Glenville	Baile
Albite-chlorite mica schist			Glenelg	Glenville	Glenville	Baile
Baltimore gneiss and granite	Brandywine	Brandywine		Glenville	Glenville	Baile
Gabbro, meta-gabbro, diabase, and other basic igneous rocks			Legore, Montalto		Kelly	Watch
Meta and serpentinized gabbro that contains some mixed or acidic rock			Neshaminy	Aldino		Watch
Serpentine			Chrome	Aldino		Watch
Hard graphitic slate approaching phyllite in crystallinity			Whiteford			
Coastal Plain Soils in Uplands						
Clays and silty clays			Loamy and clayey land [1]	Keyport		Elkton
Silts over sands			Matapeake	Mattapex		Othell
Silts over compacted silt, sand, and gravel			Chillum	Beltsville		Leonar
Sands, silts, and clays			Sassafras	Woodstown		Fallsin
Gravelly silts and sands	Joppa	Joppa	Joppa			
Loamy sands	Evesboro					
Terrace Soils						
Very old alluvium from crystalline material			Elsinboro	Delanco		Kinko
Flood Plain Soils and Local Alluvial Accumulations						
Recent alluvium from crystalline material			Comus	Codorus	Codorus	Alluvi Hat

[1] Unclassified soil material.

Interrelationships of Soil Series

In table 12, the soils of the Harford County Area are grouped to show relationships in position, parent material, and drainage. Most of the soils are on uplands, but a few are on low terraces, flood plains, foot slopes, or in depressions.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Such narrow categories of classification as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in such large areas as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*10*). Because this system is under continual study, readers in-

TABLE 13.—*Soil series classified according to the current classification system and the revised 1938 system*

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Aldino	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Baile	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Beltsville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols	Gray-Brown Podzolic soils.
Brandywine	Sandy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols	Lithosols intergrading toward Sols Bruns Acides soils.
Chester	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Chillum	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Chrome	Fine, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Codorus	Fine-loamy, mixed, mesic	Fluvaquentic Dystrochrepts.	Inceptisols	Alluvial soils.
Comus	Coarse-loamy, mixed, mesic	Fluventic Dystrochrepts	Inceptisols	Alluvial soils.
Delanco	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols	(1).
Elioak	Clayey, kaolinitic, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Elsinboro	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Evesboro	Mesic, coated	Typic Quartzipsamments	Entisols	Regosols.
Fallsington	Fine-loamy, siliceous, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Glenelg	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Glenville	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Hatboro	Fine-loamy, mixed, nonacid, mesic.	Typic Fluvaquents	Entisols	Low-Humic Gley soils.
Joppa	Loamy-skeletal, siliceous, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Kelly	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols	(1).
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils intergrading toward Gray-Brown Podzolic soils.
Kinkora	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	(1).
Legore	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Leonardtown	Fine-silty, mixed, mesic	Typic Fragiaquults	Ultisols	Planosols.
Manor	Coarse-loamy, micaceous, mesic	Typic Dystrochrepts	Inceptisols	Sols Bruns Acides.
Matapeake	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Mattapex	Fine-silty, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Montalto	Fine, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Neshaminy	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Othello	Fine-silty, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Sassafras	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Watchung	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols	Low-Humic Gley soils.
Whiteford	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Woodstown	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

[1] Unclassified.

terested in developments of the current system should search the latest literature available (*9*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 13, the soil series of the Harford County Area are placed in four categories of the current system. Table 13 also places the soils in the great group category of the 1938 classification system (*2, 11*). Classes of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

SUBORDER. Each order is divided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu*, meaning water or wet, and *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is *Fluvaquents* (*Flu*, meaning flood plain, *aqu* for wetness or water, and *ent*, from Entisols).

SUBGROUP. Each great group is divided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Fluvaquents (a typical Fluvaquent).

FAMILY. Families are established within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineral content, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineral content, and so on, that are used as family differentiae (see table 13). An example is the fine-loamy, mixed, nonacid, mesic family of Typic Fluvaquents.

Literature Cited

(1) AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS.
1961. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., illus.

(2) BALDWIN, MARK, KELLOGG, CHARLES E., and THORP, JAMES.
1938. SOIL CLASSIFICATION. U.S. Dept. Agr. Ybk. pp. 979–1001, illus.

(3) BECK, DONALD E.
1962. YELLOW-POPLAR SITE INDEX CURVES. Forest Serv., SE. Forest Expt. Sta. Res. Note 180, 2 pp., illus.

(4) LESSLEY, BILLY V. and BEITER, ROBERT J.
1972. MARYLAND AGRICULTURAL CENSUS DATA. Maryland Extension Service, Dept. Agr. and Resource Econ., Univ. of Md., AERIS 2, 80 pp.

(5) MARYLAND GEOLOGICAL SURVEY.
1969. THE GEOLOGY OF HARFORD COUNTY, MARYLAND. 133 pp., illus.

(6) NELSON, T. C., CLUTTER, J. L., and CHAIKEN, L. E.
1961. YIELD OF VIRGINIA PINE. Forest Serv., SE. Forest Expt. Sta. Paper 124, 11 pp., illus.

(7) SCHNUR, G. LUTHER.
1937. YIELD, STAND, AND VOLUME TABLE FOR EVEN-AGED UPLAND OAK FORESTS. U.S. Dept. Agr. Tech. Bul. No. 560, 88 pp., illus. (Reprinted in 1961.)

(8) SCHUMACHER, F. X., and COILE, T. S.
1960. GROWTH AND YIELDS OF NATURAL STANDS OF THE SOUTHERN PINES. 115 pp., illus.

(9) SOIL SURVEY STAFF, UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.
1970. SELECTED CHAPTERS FROM SOIL TAXONOMY OF THE NATIONAL COOPERATIVE SOIL SURVEY.

(10) SOIL SURVEY STAFF, UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.
1960. SOIL CLASSIFICATION—A COMPREHENSIVE SYSTEM, 7TH APPROXIMATION. 265 pp., illus. (Supplements issued in March 1967 and September 1968)

(11) THORP, JAMES, and SMITH, GUY D.
1949. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUP. Soil Sci. 67: 117–126.

(12) UNITED STATES DEPARTMENT OF AGRICULTURE.
1951. SOIL SURVEY MANUAL. U.S. Dept. of Agr. Handbook No. 18, 503 pp., illus.

(13) UNITED STATES DEPARTMENT OF DEFENSE.
1968. UNIFIED SOIL CLASSIFICATION SYSTEM FOR ROADS, AIRFIELDS, EMBANKMENTS AND FOUNDATIONS. MIL-STD-619B, 30 pp., illus.

(14) WHITMAN, REQUARDT and ASSOCIATES.
1961. HARFORD COUNTY WATER AND SEWAGE REPORT.

Glossary

Acid rocks. Generally light-colored rocks that are rich in silica and poor in calcium, magnesium, and iron.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; but that in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Base (chemistry). Any of the positive, generally metallic elements or combinations of elements that make up the nonacid plant nutrients. The most important of these in plant nutrition are calcium (Ca), potassium (K), magnesium (Mg), and ammonium (NH_4).

Bedding. Plowing, grading, or otherwise elevating the surface of a flat field into a series of broad beds, or "lands," so as to leave shallow surface drains between the beds.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Cropland. Land regularly used for crops, except forest crops and permanent pasture. It includes rotation pasture, cultivated summer fallow, orchards, and other land used for crops but temporarily idle.

Depth, soil. In this survey the following verbal descriptions are used for the corresponding numerical range:

Very shallow	10 inches or less
Shallow	10 to 20 inches
Moderately deep	20 to 40 inches
Deep	40 inches or more

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeab lelayer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fall line. The boundary between the Coastal Plain and the Piedmont. This line is actually a zone of considerable width in which the uplands are covered by Coastal Plain sediments and the stream channels are of hard Piedmont rocks. The prevalence of falls in the rocky channels has prompted the term "fall line."

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The base of a slope where the grade, or angle, of the slope changes toward more nearly level land.

Fragipan. A loamy, brittle subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Gleization. The reduction, translocation, and segregation of soil compounds, notably of iron, usually in the lower horizons, as a result of water-logging with poor aeration and drainage; expressed in the soil by mottled colors dominated by gray. The soil-forming processes leading to the development of a gley soil.

Gravelly soil material. From 15 to 50 percent of material, by volume, consists of rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter.

Green manure (agronomy). A crop grown for the purpose of being turned under in an early stage of maturity or soon after maturity for soil improvement.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Interceptor. A drainage ditch or tile line, generally at or near the base of a slope that protect areas downslope from the effects of seepage water.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leaching. The removal of soluble materials from soils or other material by percolating water.

Marine deposit. Material deposited in the waters of oceans and seas and exposed by the elevation of the land or the lowering of the water table.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of three simple variables—hue, value, and chroma. For example, the color notation 10YR 6/4 stands for a color that has a hue of 10YR, a value of 6, and a chroma of 4. Hue is the dominant spectral color, value relates to the relative lightness or darkness of color, and chroma is the relative purity or strength of color and increases as grayness decreases.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil and carbon, hydrogen, and oxygen obtained largely from the air and water, are plant nutrients.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water and air. The ratings of permeability are as follows:

	In per hr
Very slow	Less than 0.06
Slow	0.06 to 0.2
Moderately slow	0.2 to 0.6
Moderate	0.6 to 2.0
Moderately rapid	2.0 to 6.0
Rapid	More than 6.0

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity. See Reaction, soil.

Poorly graded. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

Productivity (of soil). The present capability of a soil for producing a specified plant or sequence of plants under a specified system of management. It is measured in terms of output, or harvest, in relation to input of production for the specific kind of soil under a specified system of management.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subgrade (engineering). The substratum, consisting of in-place material or fill material, that is prepared for highway construction; does not include stabilized base course or actual paving material.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

V-ditches. Drainage ditches that are V-shaped and have smooth side slopes.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MARYLAND AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

HARFORD COUNTY AREA, MARYLAND

Scale 1:190,080

1 0 1 2 3 4 Miles

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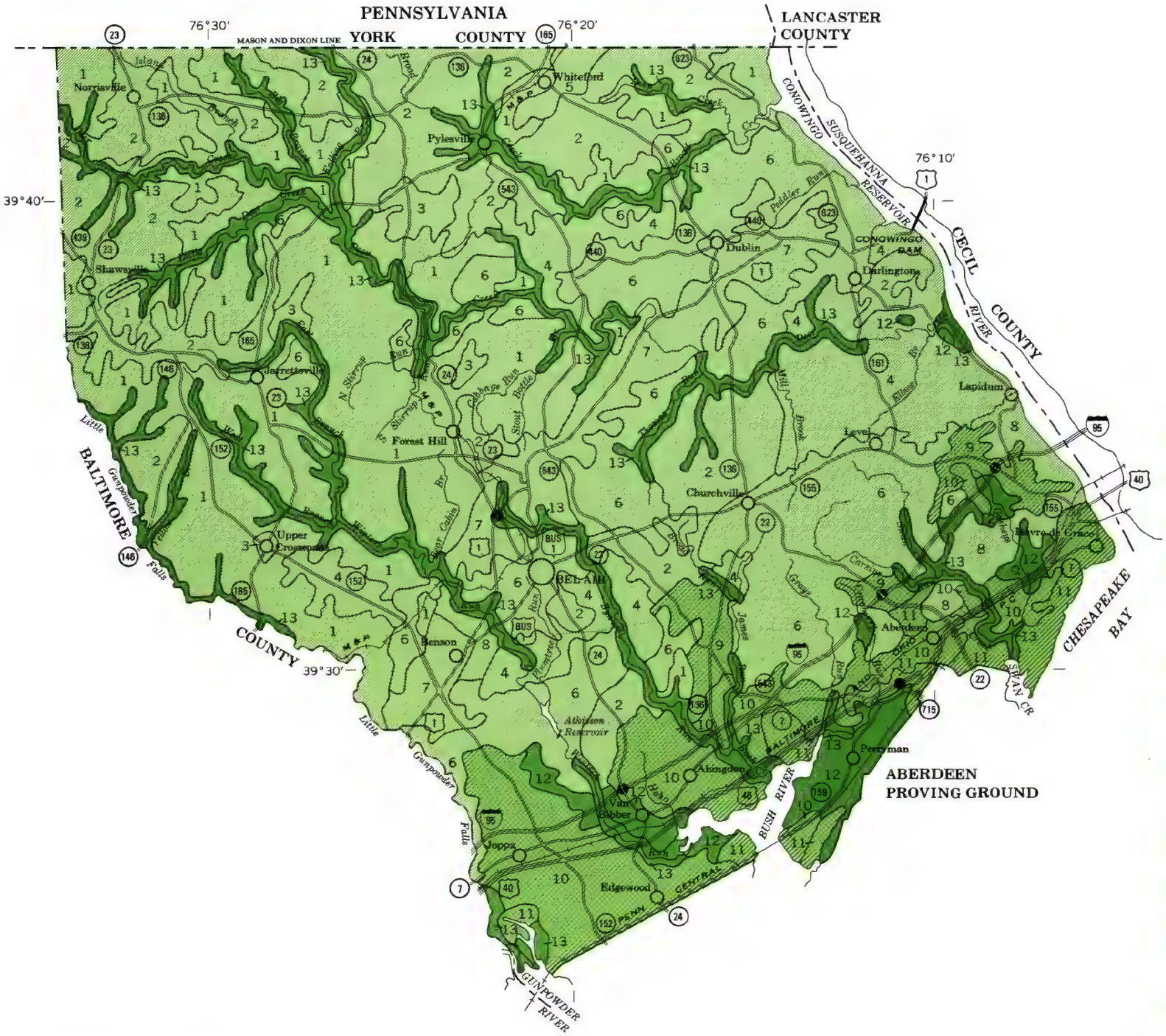

SOIL ASSOCIATIONS

SOILS OF THE PIEDMONT PLATEAU

1 — Manor-Glenelg association: Deep, steep to gently sloping, somewhat excessively drained and well drained soils that are underlain by acid crystalline rock; on uplands

2 — Chester-Glenelg-Manor association: Deep, nearly level to steep, well drained and somewhat excessively drained soils that are underlain by acid crystalline rock; on uplands having broad ridgetops

3 — Elioak-Glenelg association: Deep, gently sloping to strongly sloping, well-drained soils that are underlain by acid crystalline rock; on uplands having broad ridgetops

4 — Glenelg-Manor association: Deep, gently sloping to steep, well drained and somewhat excessively drained soils that are underlain by acid crystalline rock; on uplands

5 — Whiteford association: Moderately deep to deep, gently sloping and moderately sloping, well-drained soils that are underlain by acid slate bedrock; on uplands having broad ridgetops

6 — Neshaminy-Aldino-Watchung association: Deep, steep to nearly level, well drained to poorly drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands having many broad flats

7 — Montalto-Neshaminy-Aldino association: Deep, steep to nearly level, well drained and moderately well drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands

8 — Legore-Neshaminy-Aldino association: Deep, nearly level to steep, well drained and moderately well drained soils that are underlain by basic, semibasic, or mixed basic and acidic rocks; on uplands

SOILS OF THE ATLANTIC COASTAL PLAIN

9 — Neshaminy-Chillum-Sassafras association: Deep, nearly level to steep, well-drained soils that are underlain by semibasic or mixed basic and acidic rocks or sandy and gravelly Coastal Plain sediment; on uplands

10 — Beltsville-Loamy and Clayey land-Sassafras association: Deep, nearly level to steep, well drained and moderately well drained soils that are underlain by sandy, loamy, gravelly, or clayey sediment; on uplands

11 — Matapeake-Mattapex association: Deep, nearly level and gently sloping, well drained and moderately well drained soils that are underlain by sandy and loamy sediment; on broad, smooth uplands

SOILS OF THE FLOOD PLAINS AND LOW TERRACES

12 — Elsinboro-Delanco association: Deep, nearly level and gently sloping, well drained and moderately well drained soils that are underlain by stratified alluvial sediment; on low terraces

13 — Codorus-Hatboro-Alluvial land association: Deep, nearly level, moderately well drained to very poorly drained soils that are underlain by stratified alluvial sediment; on flood plains

Compiled 1973

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS

HARFORD COUNTY AREA, MARYLAND

Scale 1:190,080

1 0 1 2 3 4 Miles

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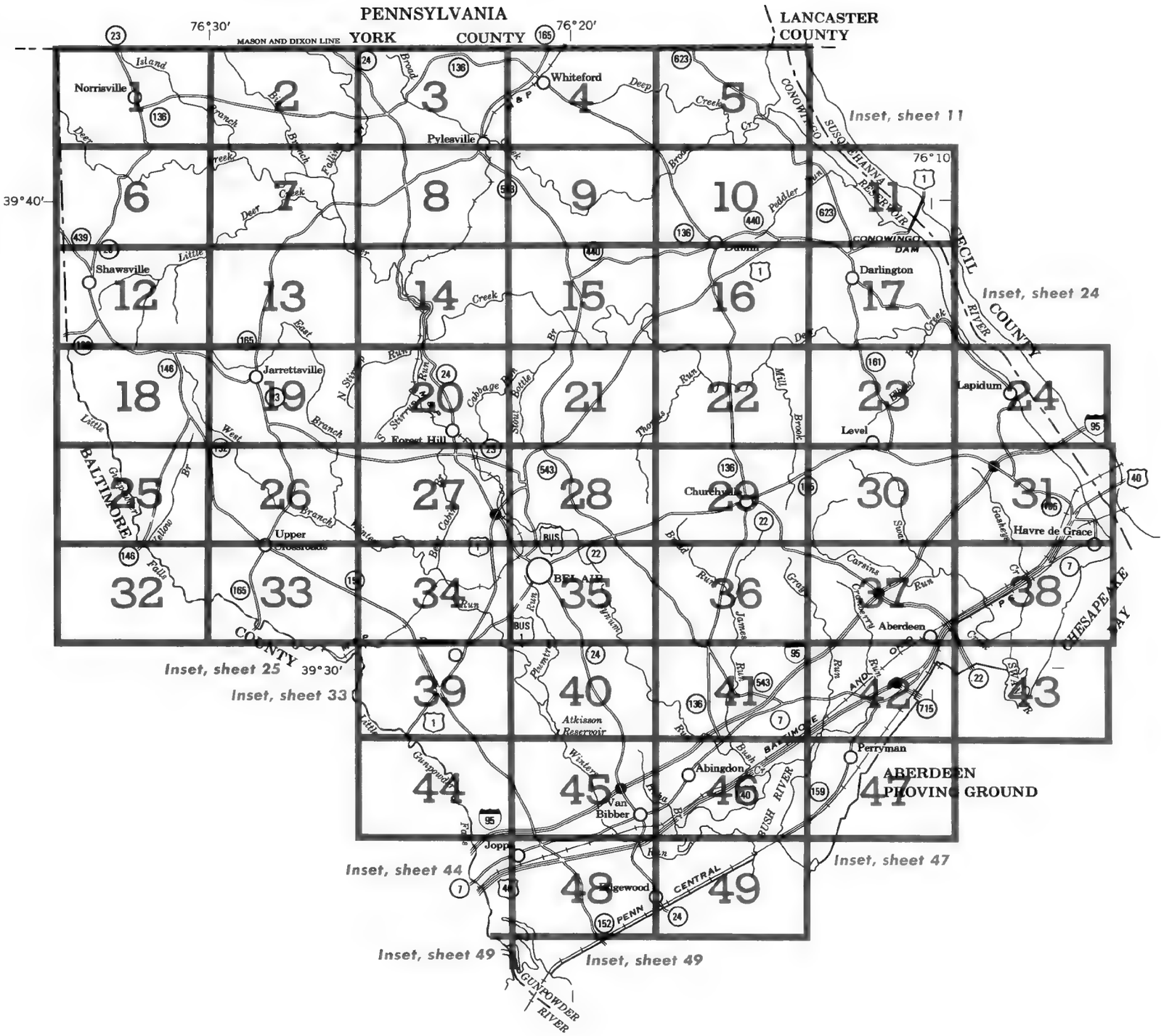


SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, or E shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. A final number 2 or 3 in the symbol shows that the soil is moderately eroded or severely eroded.

SYMBOL	NAME
AdA	Aldino silt loam, 0 to 3 percent slopes
AdB	Aldino silt loam, 3 to 8 percent slopes
AdC	Aldino silt loam, 8 to 15 percent slopes
AsB	Aldino very stony silt loam, 0 to 8 percent slopes
Av	Alluvial land
BaA	Baile silt loam, 0 to 3 percent slopes
BaB	Baile silt loam, 3 to 8 percent slopes
BeA	Beltsville silt loam, 0 to 2 percent slopes
BeB	Beltsville silt loam, 2 to 5 percent slopes
BeC	Beltsville silt loam, 5 to 10 percent slopes
BrC2	Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded
BrD3	Brandywine gravelly loam, 15 to 25 percent slopes, severely eroded
BrE3	Brandywine gravelly loam, 25 to 45 percent slopes, severely eroded
CcA	Chester silt loam, 0 to 3 percent slopes
CcB2	Chester silt loam, 3 to 8 percent slopes, moderately eroded
CcC2	Chester silt loam, 8 to 15 percent slopes, moderately eroded
CgB2	Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded
CgC2	Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded
CgD2	Chester gravelly silt loam, 15 to 25 percent slopes, moderately eroded
ChB2	Chillum silt loam, 2 to 5 percent slopes, moderately eroded
CkC2	Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded
CrE	Chrome channery silty clay loam, 15 to 45 percent slopes
Cu	Codorus silt loam
Cv	Comus silt loam
Cx	Cut and fill land
DcA	Delanco silt loam, 0 to 3 percent slopes
DcB	Delanco silt loam, 3 to 8 percent slopes
EhB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded
EhC2	Elioak silt loam, 8 to 15 percent slopes, moderately eroded
En	Elkton silt loam
EsA	Elsinboro loam, 0 to 2 percent slopes
EsB2	Elsinboro loam, 2 to 5 percent slopes, moderately eroded
EsC2	Elsinboro loam, 5 to 10 percent slopes, moderately eroded
EvC	Evesboro loamy sand, 5 to 15 percent slopes
Fs	Fallsington loam
GcB2	Glenelg loam, 3 to 8 percent slopes, moderately eroded
GcC2	Glenelg loam, 8 to 15 percent slopes, moderately eroded
GcC3	Glenelg loam, 8 to 15 percent slopes, severely eroded
GcD2	Glenelg loam, 15 to 25 percent slopes, moderately eroded
GcD3	Glenelg loam, 15 to 25 percent slopes, severely eroded
GgB2	Glenelg gravelly loam, 3 to 8 percent slopes, moderately eroded
GgC2	Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded
GgC3	Glenelg gravelly loam, 8 to 15 percent slopes, severely eroded
GgD2	Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded
GgD3	Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded
GnA	Glenville silt loam, 0 to 3 percent slopes
GnB	Glenville silt loam, 3 to 8 percent slopes
Hb	Hatboro silt loam
JpB	Joppa gravelly sandy loam, 2 to 5 percent slopes
JpC	Joppa gravelly sandy loam, 5 to 10 percent slopes
KeB	Kelly silt loam, 3 to 8 percent slopes
KeC2	Kelly silt loam, 8 to 15 percent slopes, moderately eroded
KfD	Kelly very stony silt loam, 3 to 25 percent slopes
KpA	Keyport silt loam, 0 to 2 percent slopes
KpB	Keyport silt loam, 2 to 5 percent slopes
KrA	Kinkora silt loam, 0 to 3 percent slopes
KrB	Kinkora silt loam, 3 to 8 percent slopes
LeB2	Legore silt loam, 3 to 8 percent slopes, moderately eroded
LeC2	Legore silt loam, 8 to 15 percent slopes, moderately eroded
LeD2	Legore silt loam, 15 to 25 percent slopes, moderately eroded
LeE	Legore silt loam, 25 to 45 percent slopes
LfC	Legore very stony silt loam, 0 to 15 percent slopes
LfD	Legore very stony silt loam, 15 to 25 percent slopes
LfE	Legore very stony silt loam, 25 to 45 percent slopes
LgC3	Legore silty clay loam, 8 to 15 percent slopes, severely eroded
LgD3	Legore silty clay loam, 15 to 25 percent slopes, severely eroded
Lr	Leonardtown silt loam
LyB	Loamy and clayey land, 0 to 5 percent slopes
LyD	Loamy and clayey land, 5 to 15 percent slopes
LyE	Loamy and clayey land, 15 to 30 percent slopes
MbB2	Manor loam, 3 to 8 percent slopes, moderately eroded
MbC2	Manor loam, 8 to 15 percent slopes, moderately eroded
MbC3	Manor loam, 8 to 15 percent slopes, severely eroded
MbD2	Manor loam, 15 to 25 percent slopes, moderately eroded
MbD3	Manor loam, 15 to 25 percent slopes, severely eroded
McB2	Manor channery loam, 3 to 8 percent slopes, moderately eroded
McC2	Manor channery loam, 8 to 15 percent slopes, moderately eroded
McC3	Manor channery loam, 8 to 15 percent slopes, severely eroded
McD2	Manor channery loam, 15 to 25 percent slopes, moderately eroded
McD3	Manor channery loam, 15 to 25 percent slopes, severely eroded
MdE	Manor very stony loam, 25 to 45 percent slopes
MfE	Manor soils, 25 to 45 percent slopes
MgC	Manor and Glenelg very stony loams, 3 to 15 percent slopes
MgD	Manor and Glenelg very stony loams, 15 to 25 percent slopes
MkA	Matapeake silt loam, 0 to 2 percent slopes
MkB	Matapeake silt loam, 2 to 5 percent slopes
MlA	Mattapex silt loam, 0 to 2 percent slopes
MlB	Mattapex silt loam, 2 to 5 percent slopes
MsA	Montalto silt loam, 0 to 3 percent slopes
MsB2	Montalto silt loam, 3 to 8 percent slopes, moderately eroded
MsC2	Montalto silt loam, 8 to 15 percent slopes, moderately eroded
NeA	Neshaminy silt loam, 0 to 3 percent slopes
NeB2	Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded
NeC2	Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded
NsC	Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes
NsD	Neshaminy and Montalto very stony silt loams, 15 to 25 percent slopes
NsE	Neshaminy and Montalto very stony silt loams, 25 to 45 percent slopes
Ot	Othello silt loam
Sa	Sand and gravel pits
ShB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded
ShC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded
SlB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded
SlC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded
SsD	Sassafras and Joppa soils, 10 to 15 percent slopes
SsE	Sassafras and Joppa soils, 15 to 30 percent slopes
St	Stony land, steep
Sw	Swamp
Tm	Tidal marsh
WaA	Watchung silt loam, 0 to 3 percent slopes
WaB	Watchung silt loam, 3 to 8 percent slopes
WcB	Watchung very stony silt loam, 0 to 8 percent slopes
WhB	Whiteford silt loam, 3 to 8 percent slopes
WhC2	Whiteford silt loam, 8 to 15 percent slopes, moderately eroded
WoB	Woodstown loam, 0 to 5 percent slopes

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. For complete information about a capability unit, see the section "General Principles of Soil Management." Other information is given in tables as follows:

Acreage and extent, table 3, page 12.
Predicted yields, table 4, page 53.
Woodland, table 5, page 58.

Engineering, tables 7 and 8, pages 74 to 93.
Town and country planning, tables 9, 10, and 11, pages 94 to 110.

Map symbol	Mapping unit	Page	Capability unit	Woodland subclass	
			Symbol	Symbol	Page
AdA	Aldino silt loam, 0 to 3 percent slopes	13	IIw-2	3o	65
AdB	Aldino silt loam, 3 to 8 percent slopes	14	IIe-14	3o	65
AdC	Aldino silt loam, 8 to 15 percent slopes	14	IIIe-14	3r	65
AsB	Aldino very stony silt loam, 0 to 8 percent slopes	14	VIs-3	3o	65
Av	Alluvial land	14	VIw-1	2w	64
BaA	Baile silt loam, 0 to 3 percent slopes	15	Vw-1	1w	57
BaB	Baile silt loam, 3 to 8 percent slopes	15	VIw-2	1w	57
BeA	Beltsville silt loam, 0 to 2 percent slopes	16	IIw-8	3w	66
BeB	Beltsville silt loam, 2 to 5 percent slopes	16	IIe-13	3w	66
BeC	Beltsville silt loam, 5 to 10 percent slopes	16	IIIe-13	3w	66
BrC2	Brandywine gravelly loam, 8 to 15 percent slopes, moderately eroded	17	IIIe-10	3f	67
BrD3	Brandywine gravelly loam, 15 to 25 percent slopes, severely eroded	17	VIe-3	3f	67
BrE3	Brandywine gravelly loam, 25 to 45 percent slopes, severely eroded	17	VIIe-3	3f	67
CcA	Chester silt loam, 0 to 3 percent slopes	17	I-4	2o	57
CcB2	Chester silt loam, 3 to 8 percent slopes, moderately eroded	17	IIe-4	2o	57
CcC2	Chester silt loam, 8 to 15 percent slopes, moderately eroded	18	IIIe-4	2o	57
CgB2	Chester gravelly silt loam, 3 to 8 percent slopes, moderately eroded	18	IIe-4	2o	57
CgC2	Chester gravelly silt loam, 8 to 15 percent slopes, moderately eroded	18	IIIe-4	2o	57
CgD2	Chester gravelly silt loam, 15 to 25 percent slopes, moderately eroded	18	IVe-3	2r	64
ChB2	Chillum silt loam, 2 to 5 percent slopes, moderately eroded	19	IIs-7	3o	65
CkC2	Chillum-Neshaminy silt loams, 5 to 10 percent slopes, moderately eroded	19	IIIe-7	3o	65
CrE	Chrome channery silty clay loam, 15 to 45 percent slopes	20	VIIs-32	4c	68
Cu	Codorus silt loam	21	IIw-7	1w	57
Cv	Comus silt loam	21	I-6	1o	57
Cx	Cut and fill land	21	-----	--	--
DcA	Delanco silt loam, 0 to 3 percent slopes	22	IIw-1	2o	57
DcB	Delanco silt loam, 3 to 8 percent slopes	22	IIe-16	2o	57
EhB2	Elioak silt loam, 3 to 8 percent slopes, moderately eroded	23	IIe-4	2c	64
EhC2	Elioak silt loam, 8 to 15 percent slopes, moderately eroded	23	IIIe-4	2c	64
En	Elkton silt loam	24	IIIw-9	3w	66
EsA	Elsinboro loam, 0 to 2 percent slopes	24	I-4	2o	57
EsB2	Elsinboro loam, 2 to 5 percent slopes, moderately eroded	24	IIe-4	2o	57
EsC2	Elsinboro loam, 5 to 10 percent slopes, moderately eroded	25	IIIe-4	2o	57
EvC	Evesboro loamy sand, 5 to 15 percent slopes	25	VIIs-1	3s	67
Fs	Fallsington loam	26	IIIw-7	2w	64
GcB2	Glenelg loam, 3 to 8 percent slopes, moderately eroded	26	IIe-4	2o	57
GcC2	Glenelg loam, 8 to 15 percent slopes, moderately eroded	26	IIIe-4	2o	57
GcC3	Glenelg loam, 8 to 15 percent slopes, severely eroded	27	IVe-3	2o	57
GcD2	Glenelg loam, 15 to 25 percent slopes, moderately eroded	27	IVe-3	2r	64
GcD3	Glenelg loam, 15 to 25 percent slopes, severely eroded	27	VIe-2	2r	64
GgB2	Glenelg gravelly loam, 3 to 8 percent slopes, moderately eroded	27	IIe-4	2o	57
GgC2	Glenelg gravelly loam, 8 to 15 percent slopes, moderately eroded	27	IIIe-4	2o	57
GgC3	Glenelg gravelly loam, 8 to 15 percent slopes, severely eroded	27	IVe-3	2o	57
GgD2	Glenelg gravelly loam, 15 to 25 percent slopes, moderately eroded	27	IVe-3	2r	64
GgD3	Glenelg gravelly loam, 15 to 25 percent slopes, severely eroded	28	VIe-2	2r	64
GnA	Glenville silt loam, 0 to 3 percent slopes	28	IIw-1	2w	64
GnB	Glenville silt loam, 3 to 8 percent slopes	28	IIe-16	2w	64
Hb	Hatboro silt loam	30	IIIw-7	3w	66
JpB	Jappa gravelly sandy loam, 2 to 5 percent slopes	30	IIs-4	3f	67
JpC	Joppa gravelly sandy loam, 5 to 10 percent slopes	31	IIIe-33	3f	67
KeB	Kelly silt loam, 3 to 8 percent slopes	31	IVw-3	4w	68
KeC2	Kelly silt loam, 8 to 15 percent slopes, moderately eroded	32	IVw-3	4w	68
KfD	Kelly very stony silt loam, 3 to 25 percent slopes	32	VIIs-4	4w	68
KpA	Keyport silt loam, 0 to 2 percent slopes	32	IIw-8	3w	66
KpB	Keyport silt loam, 2 to 5 percent slopes	32	IIe-13	3w	66

Map symbol	Mapping unit	Page	Capability unit	Woodland subclass	
			Symbol	Symbol	Page
KrA	Kinkora silt loam, 0 to 3 percent slopes	33	Vw-1	1w	57
KrB	Kinkora silt loam, 3 to 8 percent slopes	33	VIw-2	1w	57
LeB2	Legore silt loam, 3 to 8 percent slopes, moderately eroded	34	IIe-10	2o	57
LeC2	Legore silt loam, 8 to 15 percent slopes, moderately eroded	34	IIIe-10	2o	57
LeD2	Legore silt loam, 15 to 25 percent slopes, moderately eroded	34	IVe-10	2r	64
LeE	Legore silt loam, 25 to 45 percent slopes	34	VIe-3	2r	64
LfC	Legore very stony silt loam, 0 to 15 percent slopes	35	VIs-3	2o	57
LfD	Legore very stony silt loam, 15 to 25 percent slopes	35	VIs-3	2r	64
LfE	Legore very stony silt loam, 25 to 45 percent slopes	35	VIIs-3	2r	64
LgC3	Legore silty clay loam, 8 to 15 percent slopes, severely eroded	35	IVe-10	2o	57
LgD3	Legore silty clay loam, 15 to 25 percent slopes, severely eroded	35	VIe-3	2r	64
Lr	Leonardtown silt loam	36	IVw-3	3w	66
LyB	Loamy and clayey land, 0 to 5 percent slopes	36	IIIe-42	3c	66
LyD	Loamy and clayey land, 5 to 15 percent slopes	36	VIe-2	3c	66
LyE	Loamy and clayey land, 15 to 30 percent slopes	36	VIIe-2	3c	66
MbB2	Manor loam, 3 to 8 percent slopes, moderately eroded	37	IIe-25	2o	57
MbC2	Manor loam, 8 to 15 percent slopes, moderately eroded	37	IIIe-25	2r	64
MbC3	Manor loam, 8 to 15 percent slopes, severely eroded	37	IVe-25	2r	64
MbD2	Manor loam, 15 to 25 percent slopes, moderately eroded	37	IVe-25	2r	64
MbD3	Manor loam, 15 to 25 percent slopes, severely eroded	38	VIe-3	2r	64
McB2	Manor channery loam, 3 to 8 percent slopes, moderately eroded	38	IIe-25	2o	57
McC2	Manor channery loam, 8 to 15 percent slopes, moderately eroded	38	IIIe-25	2r	64
McC3	Manor channery loam, 8 to 15 percent slopes, severely eroded	39	IVe-25	2r	64
McD2	Manor channery loam, 15 to 25 percent slopes, moderately eroded	39	IVe-25	2r	64
McD3	Manor channery loam, 15 to 25 percent slopes, severely eroded	39	VIe-3	2r	64
MdE	Manor very stony loam, 25 to 45 percent slopes	39	VIIs-3	2r	64
MfE	Manor soils, 25 to 45 percent slopes	39	VIe-3	2r	64
MgC	Manor and Glenelg very stony loams, 3 to 15 percent slopes	39	VIs-3	2r	64
MgD	Manor and Glenelg very stony loams, 15 to 25 percent slopes	40	VIs-3	2r	64
MkA	Matapeake silt loam, 0 to 2 percent slopes	40	I-4	3o	65
MkB	Matapeake silt loam, 2 to 5 percent slopes	40	IIe-4	3o	65
MlA	Mattapex silt loam, 0 to 2 percent slopes	41	IIw-1	3o	65
MlB	Mattapex silt loam, 2 to 5 percent slopes	41	IIe-16	3o	65
MsA	Montalto silt loam, 0 to 3 percent slopes	42	I-4	2c	64
MsB2	Montalto silt loam, 3 to 8 percent slopes, moderately eroded	42	IIe-4	2c	64
MsC2	Montalto silt loam, 8 to 15 percent slopes, moderately eroded	42	IIIe-4	2c	64
NeA	Neshaminy silt loam, 0 to 3 percent slopes	43	I-4	2o	57
NeB2	Neshaminy silt loam, 3 to 8 percent slopes, moderately eroded	43	IIe-4	2o	57
NeC2	Neshaminy silt loam, 8 to 15 percent slopes, moderately eroded	43	IIIe-4	2o	57
NsC	Neshaminy and Montalto very stony silt loams, 0 to 15 percent slopes	43	VIs-3	2o	57
NsD	Neshaminy and Montalto very stony silt loams, 15 to 25 percent slopes	43	VIs-3	2r	64
NsE	Neshaminy and Montalto very stony silt loams, 25 to 45 percent slopes	43	VIIs-3	2r	64
Ot	Othello silt loam	44	IIIw-7	3w	66
Sa	Sand and gravel pits	44	VIIIs-4	--	--
ShB2	Sassafras sandy loam, 2 to 5 percent slopes, moderately eroded	45	IIe-5	3o	65
ShC2	Sassafras sandy loam, 5 to 10 percent slopes, moderately eroded	45	IIIe-5	3o	65
SlB2	Sassafras loam, 2 to 5 percent slopes, moderately eroded	45	IIe-4	3o	65
SlC2	Sassafras loam, 5 to 10 percent slopes, moderately eroded	45	IIIe-4	3o	65
SsD	Sassafras and Joppa soils, 10 to 15 percent slopes	45	IVe-5	3o	65
SsE	Sassafras and Joppa soils, 15 to 30 percent slopes	46	VIe-2	3r	65
St	Stony land, steep	46	VIIIs-1	5x	68
Sw	Swamp	46	VIIw-1	--	--
Tm	Tidal marsh	46	VIIIw-1	--	--
WaA	Watchung silt loam, 0 to 3 percent slopes	47	Vw-1	1w	57
WaB	Watchung silt loam, 3 to 8 percent slopes	47	VIw-2	1w	57
WcB	Watchung very stony silt loam, 0 to 8 percent slopes	47	VIIs-4	1w	57
WhB	Whiteford silt loam, 3 to 8 percent slopes	48	IIe-4	2o	57
WhC2	Whiteford silt loam, 8 to 15 percent slopes, moderately eroded	48	IIIe-4	2o	57
WoB	Woodstown loam, 0 to 5 percent slopes	48	IIe-16	2o	57

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 1

HARFORD COUNTY AREA, MARYLAND NO. 1

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

YORK COUNTY PENNSYLVANIA

MASON AND DIXON LINE

925 000 FEET

685 000 FEET

BALTIMORE COUNTY

Wiley

Norrisville

Island Branch

Deer Creek

Island Branch

Amos Mill

Coreo

(Joins sheet 2)

(Joins sheet 6)

940 000 FEET

675 000 FEET

N

1 Mile

5000 Feet

Scale 1:15840

2

N

MASON AND DIXON LINE

YORK COUNTY PENNSYLVANIA

960 000 FEET

685 000 FEET

945 000 FEET

675 000 FEET

1 Mile

5 000 Feet

Scale 1:15840

1 0 1000 2000 3000 4000 5000 FEET

¼ ½ ¾

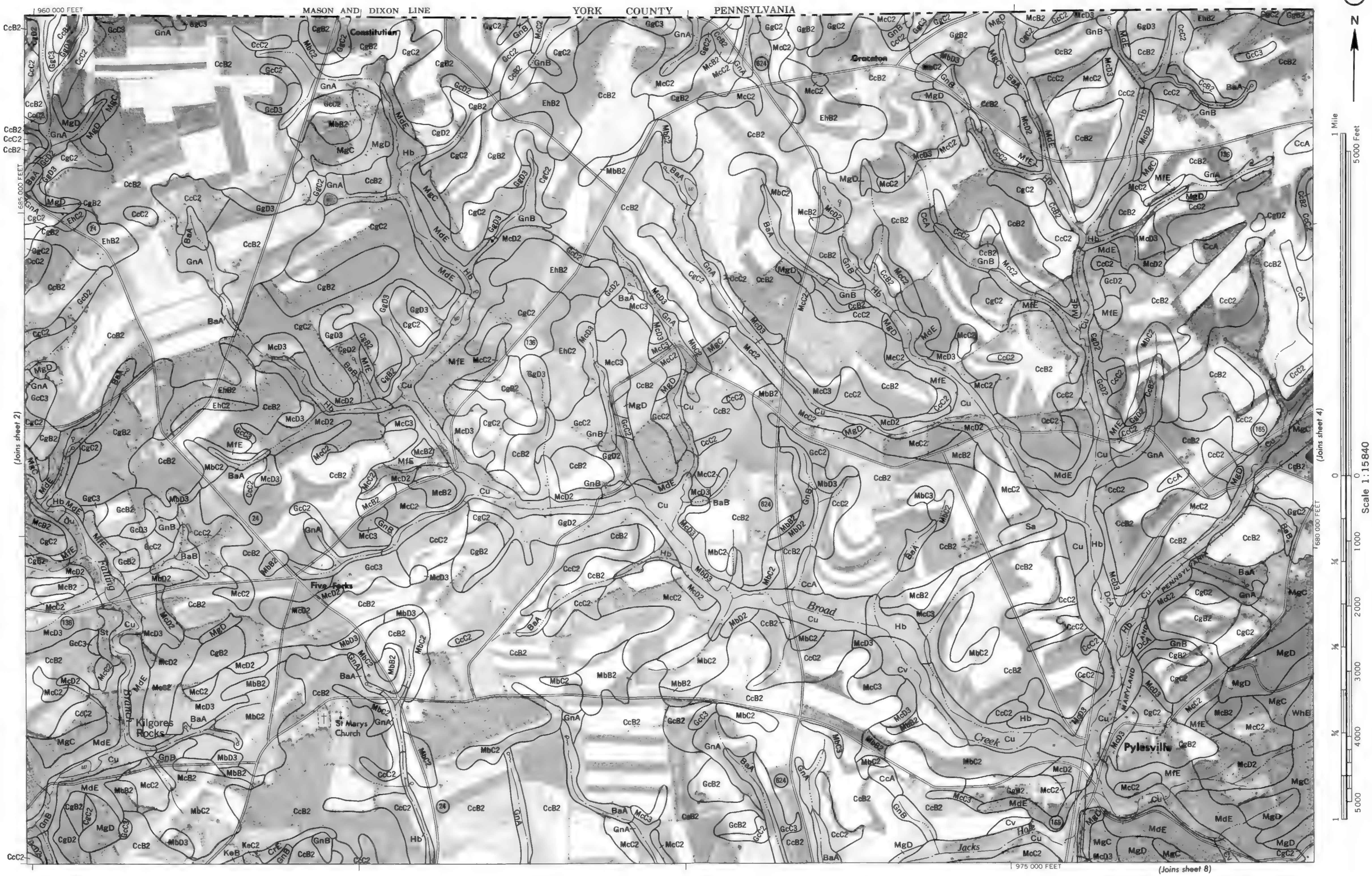
(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 7)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.



HARFORD COUNTY AREA, MARYLAND NO. 3

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 4

N

1 Mile

5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000 Feet

BaA MASON AND DIXON LINE

YORK COUNTY PENNSYLVANIA

995 000 FEET

685 000 FEET

1680 000 FEET

980 000 FEET

(Joins sheet 3)

(Joins sheet 9)

(Joins sheet 5)

Cardiff

Whiteford

Slate Ridge School

Mt Vernon Church

Prospect

Deer Creek

PENNSYLVANIA

MARYLAND

AND

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

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HARFORD COUNTY AREA, MARYLAND NO. 4

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 5

HARFORD COUNTY AREA, MARYLAND NO. 5

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

1 000 000 FEET

MASON AND DIXON LINE

YORK COUNTY

PENNSYLVANIA

LANCASTER CO PA

685 000 FEET

(Joins sheet 4)

SUSQUEHANNA RIVER

CONOWINGO

CECIL COUNTY

BROAD CREEK

Tabernacle Church

Cooper

Deer Creek

Lake Arron Straus

680 000 FEET

1 015 000 FEET

(Joins inset, sheet 11)

(Joins sheet 10)

5

N

1 Mile

5000 Feet

Scale 1:15840

1 5000 4000 3000 2000 1000 0

¾ ½ ¼ 0

6

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 6

(Joins sheet 1)

940 000 FEET

675 000 FEET

N

1 Mile

5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000

665 000 FEET

925 000 FEET

(Joins sheet 7)

(Joins sheet 12)

BALTIMORE COUNTY

Plumtree Branch

Jolly Acres Summer Camp

Deer Creek

Oak Ridge

Jackson Branch

Ayers Chapel

Dryberench

Broadenbough

McComas Branch

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 6

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 7

HARFORD COUNTY AREA, MARYLAND NO. 7

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

7

N

Scale 1:15840

1 Mile

5000 Feet

675 000 FEET

945 000 FEET

960 000 FEET

665 000 FEET

(Joins sheet 2)

(Joins sheet 6)

(Joins sheet 8)

(Joins sheet 13)

Big Branch

Falling Branch

Island Br

Deer Creek

Little Deer Creek

Little Deer Creek

Cattail Br

Hollow Br

Rock Run

8

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 8

(Joins sheet 3)

975 000 FEET

675 000 FEET

N

1 Mile

5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000

¼ ½ ¾ 1

(Joins sheet 7)

(Joins sheet 9)

665 000 FEET

CgC2

(Joins sheet 14)

965 030 FEET

North Harford High School

Bucks Corner

Holy Cross Church

Highland Church

Minefield

Street

PENNSYLVANIA

MARYLAND

Photolilase from 1:871 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

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HARFORD COUNTY AREA, MARYLAND NO. 8

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 9

HARFORD COUNTY AREA, MARYLAND NO. 9

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

980 000 FEET

675 000 FEET

(Joins sheet 8)

(Joins sheet 4)

(Joins sheet 10)

(Joins sheet 15)

665 000 FEET

1 995 000 FEET

9

N

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 10

10

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1/4 1/2 3/4 1

5000 4000 3000 2000 1000 0

1 000 000 FEET

675 000 FEET

565 000 FEET

(Joins sheet 5)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 16)

Broad Creek Church

SOUTHERN CEMETERY

Dublin

Franklin Church

Peddler Run

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

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HARFORD COUNTY AREA, MARYLAND NO. 10

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 11

11

HARFORD COUNTY AREA, MARYLAND NO. 11

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Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

(Joins inset)

1 020 000 FEET

675 000 FEET

(Joins sheet 10)

(Joins sheet 17)

1 035 000 FEET

665 000 FEET

SUSQUEHANNA RIVER

CONOWINGO RESERVOIR

CECIL COUNTY

Glen Cove

Hopkins Cove

CONOWINGO DAM

Av Rowland Island

Conowingo Village

Peddler Run

Castleton

Berkley

Hosanna Church

Hopkins Corner

1 019 000 FEET

678 000 FEET

676 000 FEET

1 021 000 FEET

(Joins upper left)

(Joins sheet 5)

2000-FOOT GRID TICKS

N

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 12

(Joins sheet 6)

940 000 FEET

660 000 FEET

(Joins sheet 13)

(Joins sheet 18)

925 000 FEET

N

1 Mile 5000 Feet

Scale 1:15840

1 0 ¼ 0 5000 4000 ¾ 3000 ½ 2000 ¼ 1000 0

650 000 FEET

BALTIMORE COUNTY

Shawsville

Blackhorse

McKendree Church

Little Creek

Deer Creek

Central Dr

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 12

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 13

HARFORD COUNTY AREA, MARYLAND NO. 13

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

(Joins sheet 12)

(Joins sheet 7)

(Joins sheet 14)

(Joins sheet 19)

945 000 FEET

960 000 FEET

660 000 FEET

650 000 FEET

N

Scale 1:15840

1 Mile

5000 Feet

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 14

(14)

N

1 Mile 5000 Feet

Scale 1:15840

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

975 000 FEET

660 000 FEET

650 000 FEET

965 000 FEET

(Joins sheet 8)

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 20)

(24)

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 14

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 15

HARFORD COUNTY AREA, MARYLAND NO 15

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

980 000 FEET

650 000 FEET

995 000 FEET

(Joins sheet 14)

(Joins sheet 9)

(Joins sheet 16)

(Joins sheet 21)

15

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1 2 3 4 5000

¼ ½ ¾ 0 ¼ ½ ¾ 1000 2000 3000 4000

(Joins sheet 10)

1 015 000 FEET

660 000 FEET

(Joins sheet 17)

N

1 Mile

5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000 FEET

(Joins sheet 15)

650 000 FEET

1 000 000 FEET

(Joins sheet 22)

Poole

Poplar Grove

McCanns Corner

Sugar Hill

Mountain Hill

Noble Mill

Hopkins Br

St Branch

DEER CR

CREEK

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 16

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 17

HARFORD COUNTY AREA, MARYLAND NO. 17

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

1 020 000 FEET

1 025 000 FEET

(Joins sheet 11)

(Joins sheet 16)

(Joins sheet 23)

1 035 000 FEET

650 000 FEET

(Joins inset, sheet 24)

SUSQUEHANNA RIVER

CECIL COUNTY

Darlington

Hollands Branch

Deer Creek

Wilson Mill

Graveyard Creek

Elbow Branch

17

N

1 Mile

5000 Feet

Scale 1:15840

(Joins sheet 12)

(Joins sheet 19)

(Joins sheet 25)

N

1 Mile

5000 Feet

Scale 1:15840

1 0 5000 4000 ¾ 3000 ½ 2000 ¼ 1000 0

840 000 FEET

645 000 FEET

640 000 FEET

925 000 FEET

BALTIMORE COUNTY

HARFORD COUNTY

Little Gunpowder Falls

Thornton

East Branch

Madonna

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 19

HARFORD COUNTY AREA, MARYLAND NO. 19

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

945 000 FEET

645 000 FEET

640 000 FEET

960 000 FEET

(Joins sheet 18)

(Joins sheet 13)

(Joins sheet 20)

(Joins sheet 26)

19

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1 2 3 4 5 Miles

1 0 1 2 3 4 5 Kilometers

Contour Interval 10 Feet

Datum is Mean Sea Level

Jarrettsville

Coopstown

JARRETTSVILLE CEMETERY

Furnace Branch

Gunpowder Falls

East Branch

North Branch

Winters Run

(Joins sheet 14)

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1000 2000 3000 4000 5000

(Joins sheet 19)

640 000 FEET

975 000 FEET

645 000 FEET

(Joins sheet 21)

(Joins sheet 27)

965 000 FEET

North Stirrup Run

Sharon Church

OLD CENTRE CEMETERY

Coopstown

Fairview Church

Forest Hill

Cabbage Run

PENNSYLVANIA AND MARYLAND

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 21

21

N

980 000 FEET

645 000 FEET

640 000 FEET

995 000 FEET

(Joins sheet 20)

(Joins sheet 15)

(Joins sheet 22)

(Joins sheet 28)

Chestnut Hill

Cabbage Run

Battle Branch

Stout Branch

Deer Creek

Sandy Hook

Kalmia

Clark Chapel

Gibson

Mt Tabor Church

Thomas Run

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND NO. 21

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

(Joins sheet 16)

N

1 Mile

5000 Feet

Scale 1:15840

1 000 000 FEET

645 000 FEET

640 000 FEET

(Joins sheet 21)

(Joins sheet 23)

(Joins sheet 29)

US MILITARY RESERVATION

DEER CREEK

Thomas Run

Tobacco Run

Coulbourn Mill Brook

Schoolhouse Run

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 23

HARFORD COUNTY AREA, MARYLAND NO 23

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

1 020 000 FEET

645 000 FEET

(Joins sheet 22)

(Joins sheet 17)

(Joins sheet 24)

(Joins sheet 30)

1 035 000 FEET

23

N

Scale 1:15840

1 Mile

5000 Feet

Glenville

Cooksville

Ethow

Rock Run Church

Garland

Level

Hopewell Church

Creek

Branch

Run

N

1 Mile

5000 Feet

Scale 1:15 840

(Joins inset)

1 055 000 FEET

650 000 FEET

655 000 FEET

1 044 000 FEET

1 039 000 FEET

(Joins sheet 17)

(Joins upper left)

(Joins sheet 23)

1 040 000 FEET

(Joins sheet 31)

AdB LfD DcB

SUSQUEHANNA RIVER

CECIL COUNTY

Robert Island

Wood Island

Spencer Island

Rock Run

Lapidum

Hurricane Run

Deer Cr

Rock Run

Cr

Cr

95

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 24

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 25

HARFORD COUNTY AREA, MARYLAND NO. 25

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

925 000 FEET

635 000 FEET

(Joins sheet 18)

25

N

1 Mile

5 000 Feet

Scale 1:15840

955 000 FEET

610 000 FEET

(Joins sheet 33)

(Joins sheet 39)

608 000 FEET

960 000 FEET

2000 AND 5000-FOOT GRID TICKS

(Joins sheet 26)

625 000 FEET

(Joins sheet 32)

940 000 FEET

BALTIMORE COUNTY

HARFORD COUNTY

Little Gunpowder Falls

Big Gunpowder Falls

Yellow Branch

Ebenezer Church

Good Will Church

Verdant Valley

Taylor

Hess

Cu

Hb

Ba

Cx

Cv

DcB

MfE

GnB

GnA

BaA

BaB

CcB2

CcC2

CgC2

CgB2

EhB2

EhC2

EsB2

EsC2

GcB2

GcC2

GcC3

GcD2

GcD3

GgB2

GgC2

GgC3

GgD2

GgD3

GnA

MbB2

MbC2

MbC3

MbD2

MbD3

McB2

McC2

McC3

McD2

McD3

MdE

MeC2

MeD2

ScC2

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 26

(Joins sheet 19)

(Joins sheet 25)

(Joins sheet 27)

(Joins sheet 33)

960 000 FEET

945 000 FEET

635 000 FEET

625 000 FEET

N

1 Mile

5000 Feet

Scale 1:15840

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

Ebenezer Church

Old Brick Church

Rutledge

Putnam

Pleasantville

West Branch

East Branch

WINTERS RUN

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 26

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 27

27

N

HARFORD COUNTY AREA, MARYLAND NO. 27

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

(Joins sheet 26)

(Joins sheet 20)

(Joins sheet 28)

(Joins sheet 34)

1 965 000 FEET

1 635 000 FEET

1 975 000 FEET

1 625 000 FEET

Rock Spring

Rock Spring Church

Bel Air Reservoir

Bynum Ridge

Bynum

Ridgecroft

Forest Lake

High Point

High Point Manor

Frogtown

Harford Estates

Long Branch

Bear Run

WINTERS RUN

MARYLAND

PENNSYLVANIA

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 28

28

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1 0

5000 4000 3000 2000 1000 0

(Joins sheet 27)

(Joins sheet 21)

(Joins sheet 29)

(Joins sheet 35)

1 995 000 FEET

1 635 000 FEET

1 625 000 FEET

1 980 000 FEET

BrD3 GcD3

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 28

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 29

29

N

1 000 000 FEET

635 000 FEET

(Joins sheet 22)

(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 36)

1 015 000 FEET

625 000 FEET

Churchville

Fulford

Coons Corner

Asbury Church

Smith Chapel

Broad Run

Cockbranch

Tobacco Run

Scale 1:15840

1 Mile

5 000 Feet

HARFORD COUNTY AREA, MARYLAND NO. 29

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 30

(30)

N

1 Mile

5000 Feet

(Joins sheet 23)

1 035 000 FEET

635 000 FEET

(Joins sheet 29)

Scale 1:15840

625 000 FEET

1 020 000 FEET

(Joins sheet 37)

(Joins sheet 31)

Hopewell Church

Aldino

Webster

Carsins Run

Deer Creek

Swan Creek

Chapel

Wesleyan Church

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 30

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 31

(Joins sheet 24)

1 040 000 FEET

1 635 000 FEET

(Joins sheet 30)

(Joins sheet 38)

1 055 000 FEET

625 000 FEET

31

N

1 Mile

5000 Feet

Scale 1:15840

1 0 1 0 5 000 4 000 3 000 2 000 1 000 0

SUSQUEHANNA RIVER

CECIL COUNTY

HAVRE DE GRACE

Havre de Grace

Earlton

Hoskins Run

Stoney Run

Gashmeyer Creek

Deer Creek

Bynum Run

Mt Erin Cem

Oakington

Penn Central

Baltimore & Ohio

Soil Conservation Service, and the Maryland Agricultural Experiment Station.

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture.

HARFORD COUNTY AREA, MARYLAND NO 31

(32)

N

1 Mile

5000 Feet

Scale 1:15840

0 0 1000 2000 3000 4000 5000

615 000 FEET

925 000 FEET

940 000 FEET

620 000 FEET

(Joins sheet 25)

(Joins sheet 33)

BALTIMORE COUNTY

Little Gunpowder Falls

DcB 146 Cu Cv GcB2 McD3 McC2 McB2 MbB2 MfE McD2 GnB GcB2 McB3 MbC3 MdE MgC MgD GgB2 GnA CcB2 GcD3 GcC2 MbC2 MbD3 GcC3 GcD2 MdC2 MgB2 MdC3 MdD3 MdD2 MdC3 GgB2 McC3

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 32

N

(Joins sheet 26)

945 000 FEET

620 000 FEET

Crossroads

Providence Church

Greendale Estates

Upper Crossroads Church

Round Acres

Lancaster Corner

Youths Benefit School

Charles Manor

Laurel Brook

Chapel Branch

Little Gunpowder Falls

BALTIMORE COUNTY

(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 39)

(Joins inset, sheet 25)

615 000 FEET

605 000 FEET

603 000 FEET

960 000 FEET

1000 AND 2000-FOOT GRID TICKS

959 000 FEET

1 Mile

5000 Feet

Scale 1:15840

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

HARFORD COUNTY AREA, MARYLAND NO. 33

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 34

(34)

(Joins sheet 27)

(Joins sheet 33)

(Joins sheet 35)

(Joins sheet 39)

975 000 FEET

620 000 FEET

615 000 FEET

965 000 FEET

N

1 Mile

5000 Feet

Scale 1:15840

0 1/4 1/2 3/4 1

1000 2000 3000 4000 5000

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 34

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 35

HARFORD COUNTY AREA, MARYLAND NO. 35

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

980 000 FEET

620 000 FEET

615 000 FEET

995 000 FEET

(Joins sheet 34)

(Joins sheet 28)

(Joins sheet 36)

(Joins sheet 40)

BEL AIR
(county seat)

Greenridge

Glenwood

Fallowsky

High School

Bynum Run

Winters Run

Deer Creek

Harford Co.

Cu water

N

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 36

(36)

N

(Joins sheet 29)

1 015 000 FEET

1 Mile

5 000 Feet

Scale 1:15840

0 ¼ ½ ¾ 1

1000 2000 3000 4000 5000

615 000 FEET

620 000 FEET

(Joins sheet 35)

(Joins sheet 37)

1 000 000 FEET

(Joins sheet 41)

Bolt Corner

Calvary

Montreal Acres

Gray's Run

Sa

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 36

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 37

HARFORD COUNTY AREA, MARYLAND NO 37

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station. Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

1 020 000 FEET

620 000 FEET

(Joins sheet 36)

(Joins sheet 30)

(Joins sheet 38)

(Joins sheet 42)

1 035 000 FEET

615 000 FEET

ABERDEEN

Carsins

Carsins Run

Grays Run

Cranberry Run

Swan Creek

Burns Corner

High School

BALTIMORE AND OHIO

PENN CENTRAL

37

N

1 Mile

5000 Feet

Scale 1:15840

N

1 Mile 5000 Feet

Scale 1:15840

(Joins sheet 37)

(Joins sheet 31)

(Joins sheet 43)

1 055 000 FEET

620 000 FEET

615 000 FEET

1 040 000 FEET

HAVRE DE GRACE

ABERDEEN

Swan Creek

Oakington Station

Osborne

Concord Point

BAY

CHESAPEAKE

CREEK

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 39

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

N

Scale 1:15840

1 Mile

5000 Feet

965 000 FEET

610 000 FEET

980 000 FEET

600 1000 FEET

(Joins inset, sheet 25)

(Joins sheet 34)

(Joins sheet 33)

(Joins sheet 40)

(Joins sheet 44)

BALTIMORE COUNTY

HARFORD COUNTY

Benson

Bagley

Lynchs Corner

Wilna

Winters Run

Gunpowder Falls

Little Gunpowder Falls

Broad Creek

Laurel Brook

Friends Church

St Marks Church

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 40

N

Scale 1:15840

1 Mile 5 000 Feet

(Joins sheet 35)

995 000 FEET

610 000 FEET

980 000 FEET

600 000 FEET

(Joins sheet 39)

(Joins sheet 41)

(Joins sheet 45)

WINTERS RUN

Plumtree Run

Atkisson Reservoir

Emmorton

Mt Carmel Church

Emmorton School

U S ARMY EDGEWOOD ARSENAL

Norris Corner

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 41

(41)

N

1 Mile

5000 Feet

Scale 1:15840

1 000 000 FEET

610 000 FEET

600 000 FEET

1 015 000 FEET

(Joins sheet 36)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 46)

HARFORD COUNTY AREA, MARYLAND NO. 41

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 42

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 42

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 43

HARFORD COUNTY AREA, MARYLAND NO. 43

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 44

(44)

N

1 Mile

5000 Feet

Scale 1:15840

(Joins lower right)

(Joins sheet 39)

(Joins sheet 48)

(Joins sheet 45)

(Joins inset A, sheet 49)

(Joins inset)

980 000 FEET

585 000 FEET

595 000 FEET

590 000 FEET

575 000 FEET

975 000 FEET

970 000 FEET

BALTIMORE COUNTY

HARFORD COUNTY

JOPPATOWNE

Stockton Mountain

Jerusalem Church

Mountain

Franksville

Little Gunpowder Falls

OHIO AND BALTIMORE

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station

HARFORD COUNTY AREA, MARYLAND NO. 44

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 45

45

N

980 000 FEET

(Joins sheet 40)

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 48)

595 000 FEET

590 000 FEET

995 000 FEET

1 Mile

5000 Feet

Scale 1:15840

MARYLAND NO. 45

HARFORD COUNTY AREA, MARYLAND

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

1 Mile
5000 Feet
Scale 1:15840

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 46

HARFORD COUNTY AREA, MARYLAND NO. 47

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.
Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

1 020 000 FEET

(Joins sheet 42)

595 000 FEET

(Joins sheet 46)

(Joins inset)

Hb

1 035 000 FEET

Perryman

Cranberry Church

CHURCH CREEK

BUSH RIVER

CENTRAL PENN

ABERDEEN PROVING GROUND

(Joins lower left)

(Joins sheet 49)

585 000 FEET

590 000 FEET

580 000 FEET

1 023 000 FEET

3000 AND 5000-FOOT GRID TICKS

47

N

1 Mile

5000 Feet

Scale 1:15840

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 48

48

N

(Joins sheet 45)

995 000 FEET

585 000 FEET

1 Mile

5000 Feet

Scale 1:15840

(Joins inset, sheet 44)

575 000 FEET

(Joins inset B, sheet 49)

985 000 FEET

(Joins sheet 49)

Joppa

Clayton Station

Edgewood Heights

McComas

Magnolia

U.S. ARMY EDGEWOOD ARSENAL

GUNPOWDER RIVER

OTTER POINT CREEK RUN

WATERS

PENN CENTRAL

Photobase from 1971 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Maryland coordinate system.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Maryland Agricultural Experiment Station.

HARFORD COUNTY AREA, MARYLAND NO. 48

HARFORD COUNTY AREA, MARYLAND — SHEET NUMBER 49

N

1 Mile

5 000 Feet

Scale 1:15840

1 000 000 FEET

585 000 FEET

580 000 FEET

1 015 000 FEET

(Joins sheet 46)

(Joins inset sheet 47)

(Joins sheet 48)

Gum Point

BUSH RIVER

POINT CREEK

OTTER

PENN CENTRAL

ABERDEEN PROVING GROUND

EDGEWOOD ARSENAL

US ARMY

PENN CENTRAL

INSET B

(Joins sheet 48)

985 000 FEET

572 000 FEET

567 000 FEET

990 000 FEET

LITTLE GUNPOWDER FALLS

GUNPOWDER FALLS

GUNPOWDER RIVER

BALTIMORE COUNTY

CENTRAL

PENN

US ARMY EDGEWOOD ARSENAL

(Joins sheet 48)

INSET A

(Joins inset, sheet 44)

978 000 FEET

572 000 FEET

570 000 FEET

980 000 FEET

2000-FOOT GRID TICKS

(Joins inset B)

LITTLE GUNPOWDER FALLS

GUNPOWDER FALLS

BALTIMORE COUNTY

GUNPOWDER RIVER

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HARFORD COUNTY AREA, MARYLAND

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

- Buildings
- School
- Church
- Mine and quarry
- Gravel pit
- Power line
- Pipeline
- Cemetery
- Dams
- Levee
- Tanks
- Well, oil or gas
- Forest fire or lookout station
- Windmill
- **Located object**

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Limit of soil survey
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

- Canals and ditches

Lakes and ponds

- Perennial (water, w)
- Intermittent (int)

- Spring
- Marsh or swamp
- Wet spot
- **Drainage end or alluvial fan**

RELIEF

Escarpments

- Bedrock
- Other

- Short steep slope
- Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully